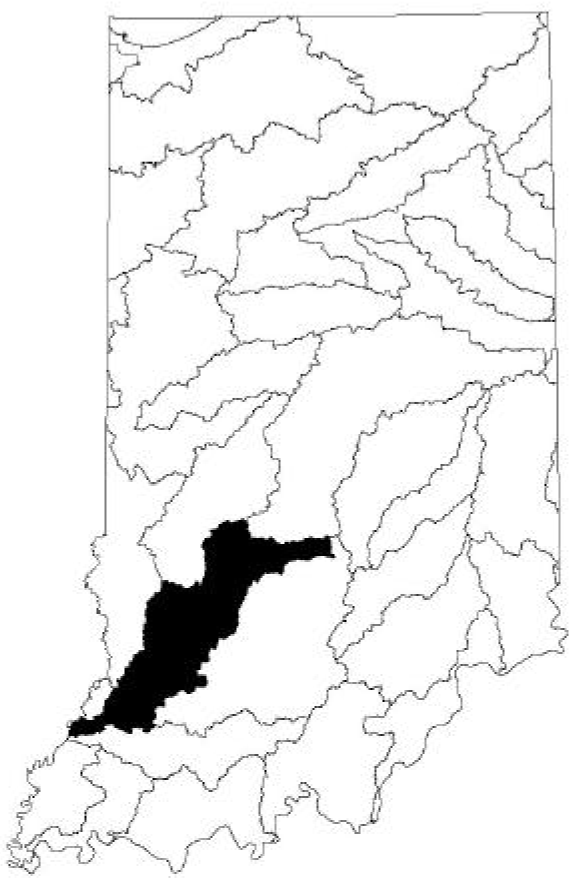
Lower White River Watershed Restoration Action Strategy

Part I: Characterization and Responsibilities



Prepared by

Indiana Department of Environmental Management

Office of Water Quality

January 2001

FOREWORD

The First Draft (January 2000) of the Watershed Restoration Action Strategy (WRAS) was reviewed internally by IDEM and revised accordingly. The Second Draft (Spring 2000) was reviewed by stakeholders and revised accordingly. This Third Draft (January 2001) is intended to be a living document to assist restoration and protection efforts of stakeholders in their sub-watersheds. As a "living document" information contained within the WRAS will need to be revised and updated periodically.

The WRAS is divided into two parts: Part I, Characterization and Responsibilities and Part II, Concerns and Recommendations.

James Dunaway, Resource Conservationist
IDEM Office of Water Quality
100 N. Senate Avenue
P.O. Box 6015
Indianapolis, IN 46206-6015

jdunaway@dem.state.in.us

TABLE OF CONTENTS

List of Tables

List of Figures

List of Appendices

EXECUTIVE SUMMARY

The overall goal and purpose of Part I of the Watershed Restoration Action Strategy (WRAS) is to provide a reference point and map to assist local citizens with improving water quality. The major water quality concerns and recommended management strategies will be addressed in Part II: Concerns and Recommendations of the WRAS.

This Strategy broadly covers the entire watershed; therefore, it is intended to be an overall strategy and does not dictate management and activities at the stream site or segment level. Water quality management decisions and activities for individual portions of the watershed are most effective and efficient when managed through sub-watershed plans. However, these sub-watershed plans must also consider the impact on the watershed as a whole.

This Strategy is intended to be a fluid document in order to respond to the changing and dynamic quality of our environment. Therefore, this Strategy will require revision when updated information becomes available.

Overview of the Lower White River Watershed

The Lower White River watershed is the lower portion of the White River watershed (also known as the West Fork White River) located in west central Indiana. The Lower White River watershed begins near Gosport, Indiana and flows southwest to its confluence with the Wabash River near the town of East Mount Carmel, in Gibson County. The watershed covers portions of Brown, Daviess, Gibson, Greene, Knox, Martin, Monroe, Owen, Pike, and Sullivan counties. It encompasses 1,645 square miles and includes approximately 1,079 miles of perennial streams. The watershed system contains the following major streams: Beanblossom Creek, Conger Creek, First Creek, Fish Creek, Lake Greenwood, Lake Lemon, Plummer Creek, Prairie Creek, Lattas Creek and Richland Creek. The Lower White River also receives flow from the Upper White River, the East Fork White River, and the Eel River drainage basins. The watershed contains many lakes and ponds.

The land use in the watershed is predominantly agriculture, which represents approximately 60 percent of the land cover. Corn and soybeans comprise the majority of crops produced. Other land uses include forest, pasture, and urban areas. Development varies from low to high in the watershed, with scattered residential development throughout the area. Industrial and commercial development is higher in the more populated areas within the watershed. Surface coal mining has impacted many acres in Owen, Greene, Knox, and Sullivan counties.

Washington is the major urban area wholly within the watershed. The second largest urban area within the watershed is Linton. Only a small portion of the Bloomington metro area is within the watershed. The Natural Resources Commission designates the West Fork of the White River as an "Outstanding River" from Farmland to its confluence with the Wabash River, this includes the section referred to as the Lower White River (see Section 2.4).

Current Status of Water Quality in the Lower White River Watershed

Section 303(d) of the Clean Water Act requires states to identify waters that do not meet, or are not expected to meet, applicable water quality standards. The Clean Water Act Section 303(d) list for Indiana provides a basis for understanding the current status of water quality in the Lower White River Watershed. The following waterbodies are on Indiana's 1998 Clean Water Act Section 303(d) list submitted to and approved by EPA:

Beanblossom Creek for E. coli violations
East Fork Fish Creek for impaired biotic communities
First Creek for E. coli violations
Jacks Defeat Creek for impaired biotic communities
Kessinger Ditch for E. coli violations
Lake Lemon for PCB fish consumption advisory
McCormick's Creek for impaired biotic communities
Plummer Creek for E. coli violations
Prairie Creek North and South Forks for E. coli violations
Richland Creek for impaired biotic communities, E. coli violations, and mercury and PCB fish consumption advisories
South Fork Griffy Creek for impaired biotic communities
West Fork White River for impaired biotic communities, E. coli violations, Cyanide, and mercury, PCB, and lead fish consumption advisories

Water Quality Goal

The overall water quality goal for the Lower White River Watershed is that all waterbodies meet the applicable water quality standards for their designated uses as determined by the State of Indiana, under the provisions of the Clean Water Act.

Lower White River Watershed Restoration Action Strategy

Part I: Characterization and Responsibilities

1. Introduction

The Clean Water Action Plan states that "States and tribes should work with public agencies and private-sector organizations and citizens to develop, based on the initial schedule for the first two years, Watershed Restoration Action Strategies, for watersheds most in need of restoration." A WRAS is essentially a large-scale coordination plan for an eight-digit hydrologic unit watershed targeted by the Unified Watershed Assessment. In Indiana, 11 such units, including the Lower White River watershed, were designated for restoration by the FFY 1999 Unified Watershed Assessment. Each year, the Assessment will be refined further as additional information becomes available, and targeted areas will become more specific. This will require amendments to the WRAS, which must be flexible and broad enough to accommodate change. The WRAS will also foster greater cooperation among State and Federal agencies, which should result in more effective use of personnel and resources.

The WRAS provides an opportunity to assemble, in one place, projects and monitoring that has been completed or is on going within a watershed. It also allows agencies and stakeholders to compare watershed goals and provides a guide for future work within a watershed.

The WRAS for the Lower White River watershed contains two parts. Part I provides a characterization of water quality in the watershed and agency responsibilities. Part II provides a discussion of resource concerns and recommended strategies.

1.1 Purpose of This Document

The overall goal and purpose of the Watershed Restoration Action Strategy Part I is to provide a reference point and roadmap to assist with improving water quality. Part I is a compilation of information, facts, and local concerns in this watershed. It will serve as a reference document for watershed groups and others involved in the assessment and planning of watershed restoration activities.

Part I of the Strategy is intended to be a fluid document in order to respond to the changing and dynamic quality of our environment. Therefore, it will require revision when updated information becomes available.

1.2 Guide to the Use of This Document

Chapter 1: Introduction - This Chapter provides a non-technical description of the purpose of Part 1 of the Strategy. This Chapter also provides an overview of stakeholder groups in the Lower White River watershed.

Chapter 2: General Watershed Description- Some of the specific topics covered in this chapter include:

An overview of the watershed
Hydrology of the watershed
A summary of land use within the watershed
Natural resources in the watershed
Population statistics
Major water uses in the watershed
Water quality classifications and standards

Chapter 3: Causes and Sources of Water Pollution - This Chapter describes a number of important causes of water quality impacts including biochemical oxygen demand (BOD), toxic substances, nutrients, E. coli bacteria and others. This Chapter also describes both point and nonpoint sources of pollution.

Chapter 4: Water Quality and Use Support Ratings - This Chapter describes the various types of water quality monitoring conducted by IDEM. It summarizes water quality in the watershed based on Office of Water Quality data, and presents a summary of use support ratings for those surface waters that have been monitored or evaluated.

Chapter 5: State and Federal Water Quality Programs - Chapter 5 summarizes the existing State and Federal point and nonpoint source pollution control programs available to address water quality problems. These programs are management tools available for addressing the priority water quality concerns and issues that are discussed in Part II of the Strategy. Chapter 5 also describes the concept of Total Maximum Daily Loads (TMDLs). TMDLs represent management strategies aimed at controlling point and nonpoint source pollutants. IDEM's TMDL Strategy will also be discussed.

1.3 Stakeholder Groups in the Watershed

The Lower White River watershed contains several stakeholder groups that have different missions (Appendix C). Many of these groups have a long history of conservation work in the Lower White River watershed. The following discussions briefly describe some of the watershed groups.

Local Soil & Water Conservation Districts (SWCDs)

Soil and Water Conservation Districts are local sub-divisions of state government, charged with overseeing the protection of soil and water resources at the local level. Indiana has 92 SWCDs, one in each county. The SWCD is led by a board of supervisors, elected by local citizens. At the beginning of 1997, the local Soil & Water Conservation Districts in every county in Indiana convened meetings of local stakeholders as a part of their 'locally led conservation' program. The purpose of these meetings was to get public input on natural resource concerns within each county and to lay the groundwork for resource protection.

Resource Conservation & Development Councils (RC&Ds)

The Food and Agriculture Act of 1962 facilitated the development of RC&D councils as a U.S. Department of Agriculture (USDA) program. The USDA's Natural Resources Conservation Service (NRCS) administers the RC&D program.

The purpose of RC&D councils is to enable local leaders to develop and carry out a plan for the conservation and wise use of the natural and human resources available, and to improve the economic and social well being of all citizens within the RC&D area. The councils are volunteer organizations, which represent local people. RC&D councils are 501(c)(3) Not-for-Profit organizations working in partnership with local, state, and federal programs.

Three RC&D councils cover the Lower White River watershed. The Sycamore Trails RC&D encompasses Owen county. The Four Rivers RC&D covers Gibson, Greene, Knox, and Pike counties. Hoosier Heartland RC&D covers Brown and Monroe counties.

Conservancy Districts

The development of conservancy districts is an increasingly active option for addressing a variety of land use issues at the local level. Freeholders within contiguous geographic areas may use a conservancy district to achieve a dependable drinking water supply, to provide for sewage collection and treatment, to improve flood control, to reduce soil erosion, or to achieve any of numerous other community goals, either singly or in combination (IC 14-33-1-1).

The determination whether to approve the establishment of a conservancy district and the primary responsibility for the oversight of an existing conservancy district rests with a circuit court where the district is located (IC 14-33-2-26). Management of the district itself is under the control of a board of directors, selected initially by the county commissioners and subsequently by the freeholders of the district (IC 14-33-5-11). (http://www.ai.org/nrc/procedur.htm)

There are three Conservancy Districts in the Lower White River watershed. The Prairie Creek Conservancy District, located in Daviess County, was formed to address flooding, drainage, and soil erosion in the Prairie Creek watershed. The District oversees operation and maintenance on the flood control structures, channels and levees constructed under the USDA Small Watershed Program (P.L.83-566). The Lattas Creek Conservancy District, located in Greene County, was formed to address flooding and drainage on Lattas Creek. The District oversees maintenance on the channels and levees constructed under the Small Watersheds Program. The Lake Lemon Conservancy District, located in Brown and Monroe counties, was formed to address maintenance and recreation issues on Lake Lemon. The District oversees maintenance of the dam and lake and is currently working on a watershed management plan.

Drainage and Levee Associations

Throughout the watershed there are numerous levee and drainage associations or districts. These districts or associations formed under various state laws and often have taxing authority. The majority of these associations exist to operate and maintain manmade drains and levees within the flatland areas along the major channels. These drains and levees were constructed to provide drainage and prevent flooding in low-lying areas. These districts and associations may be located by contacting the County Surveyor or Auditor's offices in Knox, Greene, and Daviess counties.

Other Stakeholders

Additional stakeholder groups may be local or statewide citizen groups interested in water quality or wildlife issues, local county government offices, and local industries with environmental interests.

2 General Watershed Description

This Chapter provides a general description of Lower White River and its watershed and includes the following:

2.1 Lower White River Watershed Overview

The Lower White River watershed is the lower portion of the White River watershed (also known as the West Fork White River) located in west central Indiana. The Lower White River watershed begins near Gosport, Indiana and flows southwest to its confluence with the Wabash River near the town of East Mount Carmel, in Gibson County. The watershed covers portions of Brown, Daviess, Gibson, Greene, Knox, Martin, Monroe, Owen, Pike, and Sullivan counties. It encompasses 1,645 square miles and includes approximately 1,079 miles of perennial streams. The watershed system contains the following major streams: Beanblossom Creek, Conger Creek, First Creek, Fish Creek, Lake Greenwood, Lake Lemon, Plummer Creek, Prairie Creek, Lattas Creek and Richland Creek. The Lower White River also receives flow from the Upper White River, the East Fork White River, and the Eel River drainage basins. The watershed contains many lakes and ponds.

The land use in the watershed is predominantly agriculture, which represents approximately 60 percent of the land cover. Corn and soybeans comprise the majority of crops produced. Other land uses include forest, pasture, and urban areas. Development varies from low to high in the watershed, with scattered residential development throughout the area. Industrial and commercial development is higher in the more populated areas within the watershed. Surface coal mining has impacted many acres in Owen, and Greene counties.

Washington is the major urban area wholly within the watershed. The second largest urban area within the watershed is Linton. Only a small portion of the Bloomington metro area is within the watershed. The Natural Resources Commission designates the West Fork of the White River as an “Outstanding River” from Farmland to its confluence with the Wabash River, this includes the section referred to as the Lower White River (see Section 2.4).

The Lower White River watershed is an 8 digit (05120202) hydrologic unit code (HUC) watershed located in west central Indiana (Figure 2-1). It is subdivided into 86 sub-basins represented on the map by 14 digit HUCs (figure 2-2). The Lower White River watershed is located in six different ecoregions, which are described below (USEPA/USGS, Ecoregions of Indiana and Ohio).

Portions of Greene, Martin, Monroe, and Owen counties are located in the Crawford Uplands ecoregion (71a), which is characterized by unglaciated heavily dissected hills with narrow valleys and high gradients. Terrain is rugged in the east. Native vegetation was mostly Oak-Hickory forest on the uplands, and a few barrens. Land use consists of mostly forest with some general farming in the west and in the valleys.

The Mitchell Plain ecoregion (71b) covers parts of Monroe and Owen counties. Characteristics of this region are unglaciated, gently rolling plains, and karst terrain with entrenched streams. Stream density is low where sinkholes and underground drainage are present. Native vegetation was western mesophytic forest, karst wetlands, and limestone glades. Present land use is general farming, residential, woodland in rugged areas, and many limestone quarries.

The northern portions of Brown and Monroe counties lie within the Norman Upland ecoregion (71c), which is characterized by unglaciated, deeply dissected high hills with narrow valleys, and medium to high stream gradients. Native vegetation was Oak-Hickory forest on uplands, and Beech forest in the valleys. Current land use is mostly forest consisting of Oak, Virginia pine, and Beech-Maple.

The Wabash Bottomlands ecoregion (72a) includes portions of Gibson and Knox counties. Characteristics of this region are glaciated and unglaciated, nearly level alluvial plain with terraces, low gradient streams, and oxbow lakes. Bottomland forests were native vegetation, as were pond, swamp and slough communities. Present land use is cropland, woodland, wetlands, oil production, and mineral extraction.

The largest portions of Daviess, Greene, and Knox counties lie within the Glaciated Wabash Lowlands ecoregion (72b). This region is glaciated, undulating to rolling lowland plain with wide, low gradient valleys. Dunes have formed in the western portions. Native vegetation consisted of Oak-Hickory forest, Beech forest, and scattered prairies. Land use is currently grain crops, vegetable crops, coal mining, and woodland.

Small portions of Gibson and Pike counties are in the Southern Wabash Lowlands ecoregion (72c), which is characterized as glaciated and unglaciated, undulating to rolling terrain with wide, shallow valleys and low to medium gradient streams, with paleodunes to the west. Native vegetation was western mixed mesophytic forest, southern swamp forest, and Oak-Hickory forest. Present land use includes grain crops, vegetable crops, woodland, coal mining, and oil production.

Geology and Soils

The Lower White River watershed covers a vast landscape that has numerous landforms. The area is underlain with limestone and siltstone of Mississippian age in the northern part and sandstone and shale of Pennsylvanian age in the Southern part. The soils on the upland ridges and shoulders formed from loess of Wisconsin age and Illinoian aged glacial till. The soils on the steeper side slopes along the river and its major tributaries formed mostly from the native bedrock and are less productive than the typical glacial till soils in the basin.

The flood plains in the area are either smaller tributaries associated with the uplands, or broader areas along the White River. The floodplain soils are formed mainly from silty alluvium eroded from the surrounding uplands.

The major land use in the area is cropland on the flood plains and upland ridges and pasture and woodland on the steeper side slopes.

The erosion potential of the soils in the basin range from low through high. About 50% of the basin is in the high and very high erosion potential categories (IDNR, 1980) (Figure 2-3). Erosion may result in a significant impact to water quality due to nutrients and pesticides carried in the sediment loads from eroding areas.

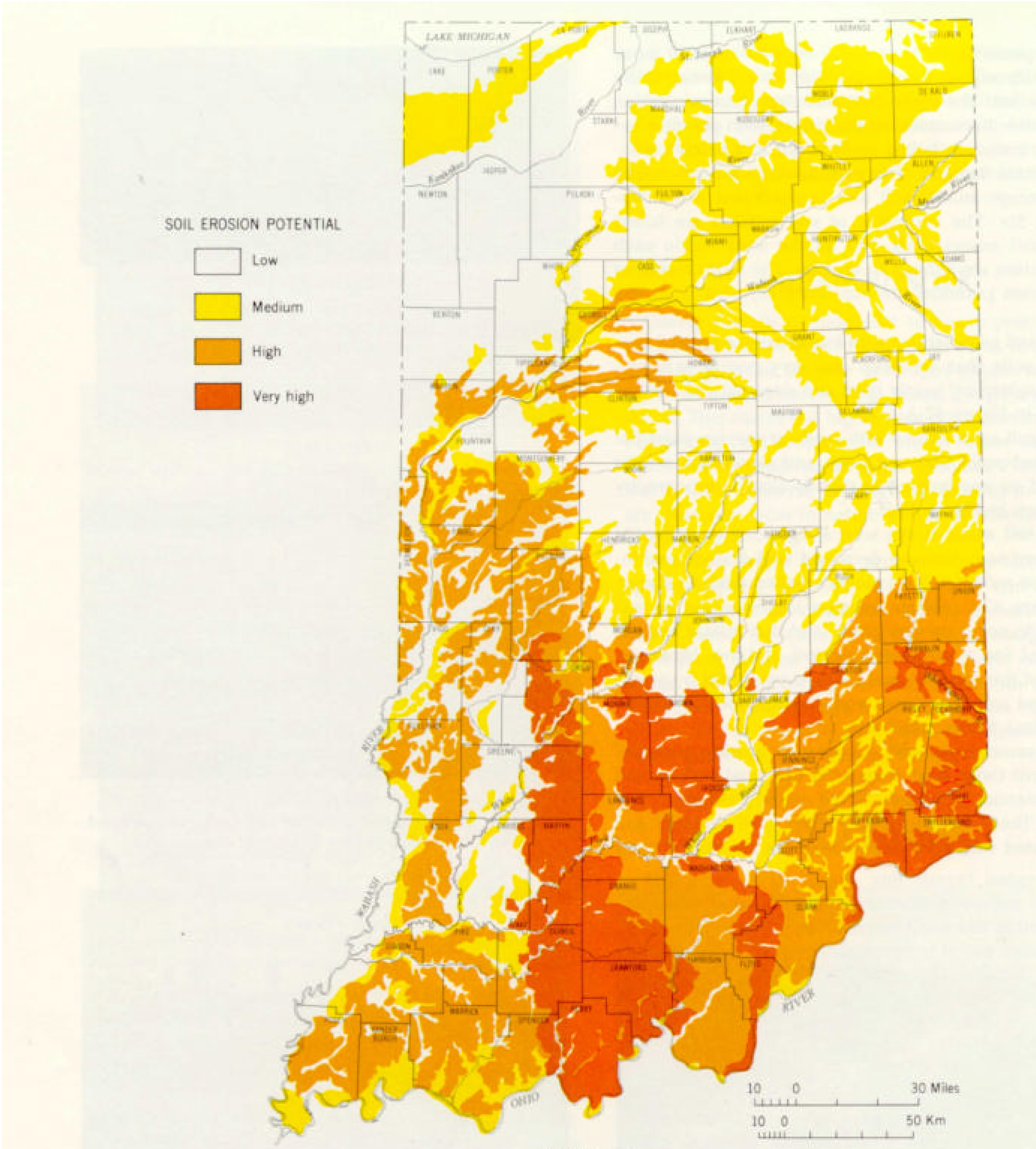


Figure 43
Map showing soil erosion potential of Indiana soil associations.

FIGURE 2-3 EROSION POTENTIAL *
**** from The Indiana Water Resource, IDNR, 1980***

Climate

Climate in the Lower White River watershed region is humid continental, and temperatures fluctuate widely between seasons. Average yearly precipitation for the watershed is approximately 42 inches with an average yearly snowfall of approximately 14 inches (USDA, NRCS 1981, 1988, 1989). January average daily maximum and minimum temperatures are 38° F and 19° F, respectively, while July average daily maximum and minimum temperatures are 87° F and 64° F, respectively (USDA, NRCS 1981, 1988). Annual average precipitation runoff in the basin is 12 to 14 inches (IDNR 1980).

White River

The Lower White River is actually the southern portion of the West Fork White River. The section referred to as the Lower White River begins near the town of Gosport in Owen County. From Gosport it flows southwest to a point near the town of Ewardsport, where it turns and flows southward to the confluence of the East Fork White River just north of Petersburg in Pike County. It then flows west-southwest to its confluence with the Wabash River near the town of East Mt. Carmel in Gibson County.

Black Creek

Black Creek headwaters originate south of Vicksburg in Greene County. It flows southward to a point west of Linton, where it turns and flows southeast toward Marco. Just south of Marco it turns and flows southwest out of Greene County and into Knox County. It continues to flow south-southwest through Knox County to its confluence with the West Fork White River about one mile east of Edwardsport. Black Creek includes the combined flows of Buck Creek (east of Vicksburg), Beehunter Ditch, Hamilton Ditch, Black Creek Ditch, Brewer Ditch, Old Black Creek (all in Greene County), and Singer Ditch (in Knox County).

River Deshee/Plass Ditch

The River Deshee is located entirely within Knox County. The western most headwaters of the River Deshee originate in a triangular area formed by Thompson Road, Monty Road, and U.S. 50, one mile east of Vincennes. The northern most headwaters originate in an unnamed tributary north of the town of Fritchton. The eastern most headwaters originate in an unnamed channel ¼ mile north of Monroe City. The majority of the headwater channels are manmade ditches. The River Deshee flows in a southwesterly direction until it intersects Rehwald Road. From this point it flows, as the Plass Ditch, due south to its confluence with the West Fork White River southwest of the town of Decker. The river is levied on its north and west sides from the intersection of Decker and McCormick roads to its outlet at the White River, a distance of approximately three miles. Originally, the River Deshee continued its southwesterly flow from the Rehwald Road area to its confluence with the Wabash River in western Knox County. Today, the majority of the flow is redirected into the West Fork White River by the manmade Plass Ditch. The portion of the River Deshee west of U.S. 41 still flows to the Wabash.

Kessinger Ditch

The Kessinger Ditch headwaters begin south of the town of Bruceville, in the area of the intersection of White Oaks, Grundman, and Red roads. The channel begins as a tributary of Pond Creek and flows south-southeast to become Pond Creek. Pond Creek becomes Kessinger Ditch near the channels' intersection with University Road. Kessinger Ditch continues to flow south-southeast across Knox County to its confluence with the West Fork White River in Section 36 of Harrison Township. The Kessinger Ditch watershed is totally within Knox County and includes flow from the Roberson Ditch, Frick Ditch, and numerous smaller manmade ditches.

Richland Creek

The most northern headwaters of the Richland Creek watershed begin in Section 21 and 22 of Richland Township in Monroe County. From the headwaters area Richland Creek flows south-southwest to its confluence with an unnamed tributary, whose headwaters originate in Section 34 of Richland Township, just south of a stone quarry. Richland Creek continues its south-southwest flow then turns due west, after it crosses State Road 48, and flows into Owen County where it parallels State Road 43 for a short distance before it enters Greene County. Richland Creek continues its southwesterly flow past Hendricksville and Bloomfield to its confluence with Plummer Creek along U.S. 231 south of Bloomfield. At the confluence with Plummer Creek, the flow changes to due west for a short distance to its confluence with West Fork White River. Richland Creek includes flow from Plummer Creek, Beech Creek, and Camp Creek.

Beanblossom Creek

The headwaters of Beanblossom Creek originate at the town of Spearsville in Brown County. From Spearsville it flows due south to its confluence with East Fork, just north of State Road 45. As the channel crosses State Road 45 it begins a westerly flow past the towns of Beanblossom, Helmsburg, and Trevlac on its way to Lake Lemon and Monroe County. The outflow from the lake exits on the northwest end of the lake and flows northward to its confluence with Honey Creek, where it turns westward, then southwest. Beanblossom then resumes a southwesterly flow towards its confluence with Muddy Fork, north of Bloomington, where it turns due west and flows across State Road 37. After crossing State Road 37 the channel turns and flows northwest across Monroe county to its confluence with the West Fork White River (Lower White) just south of Gosport. Beanblossom includes flows from Indian Creek, Stout Creek, Muddy Fork, Buck Creek, Honey Creek (all in Monroe County), and Bear Creek and Lick Creek in Brown County.

McCormicks Creek

McCormicks Creek headwaters originate due west of Elletsville in Monroe County. The channel flows northwest through Monroe County for about 1½ miles before it enters Owen County. It continues its northwest flow through Owen County, where it bisects the McCormicks Creek State Park before emptying into the Lower White northeast of Spencer. McCormicks Creek includes flows from several unnamed tributaries along its short path of approximately 5½ miles.

Lakes

There are many lakes within the watershed. Most of the lakes are man-made impoundments, which outlet into surface waters. Many of the lakes were constructed for recreation, flood control, water supply, wildlife, or residential development. Lakes present special concerns to water quality, as they tend to trap sediments, nutrients, and other contaminants, and keep them in a closed system. Some of the larger lakes in the watershed are Lake Lemon in Brown and Monroe counties, Lake Greenwood in Martin County and Griffy Reservoir in Monroe County. Many lakes in this watershed are the result of surface coal mining activities.

2.2 Land Cover, Population, and Growth Trends

2.2.1 General Land Cover

Native vegetation in the Lower White River watershed is Oak-Hickory forest, Beech forest, scattered prairies, Bottomland forest, pond, swamp, and slough communities. The U.S. Geological Survey - Biological Resources Division and the U.S. Fish and Wildlife Service are overseeing the National Gap Analysis Program (GAP). In Indiana, Indiana State University and Indiana University are carrying out the Indiana GAP Project which involves an analysis of current vegetative land cover through remote sensing (ISU 1999). This analysis provides vegetative land cover data in 30 by 30-meter grids (Figure 2-4). The following is a summary of vegetative cover in the watershed determined from the GAP image:

1.8%	Urban (impervious, low and high density)
60.2%	Agricultural vegetation (row crop and pasture)
33.3%	Forest vegetation (shrubland, woodland, forest)
3.4%	Wetland vegetation (Palustrine: forest, shrubland, herbaceous)
1.25%	Open Water

2.2.2 Population

The 1990 total population in the ten counties that have land portions in the watershed was 312,000 (IRBC 1993). Table 2-1 shows a break down of population by county and estimated population projections. It should be noted that these numbers do not reflect the actual population living in the Lower White River watershed. For example, only a portion of 10 counties are within the land area of the Lower White River watershed (Figure 2-1). A better estimate of the population within the Lower White River watershed may be the 1990 and 1995 U.S. Geological Survey Water Use Reports, which show a total population in the watershed of 168,450 in 1990 and 132,000 in 1995 (Table 2-6). These reports indicate that the population in the watershed appears to have grown by about declined by about percent between 1990 and 1995.

The U.S. Census and the Indiana Business Research Center also provide information about the population in cities and towns. Table 2-2 contains population estimates for various cities and towns located wholly within the watershed. Washington is the largest city located in the watershed in terms of population.

TABLE 2-1
LOWER WHITE RIVER COUNTY POPULATION PROJECTIONS 1990-2020*

County	1990	2000	2010	2020	Percent Change (1990 to 2020)
Brown	14,100	14,900	14,900	14,400	+2.12
Daviess	27,500	28,000	28,900	30,100	+2.18
Gibson	31,900	31,300	31,400	31,400	-1.56
Greene	30,400	30,400	30,400	30,100	-0.99
Knox	39,900	39,000	38,500	37,700	-5.51
Martin	10,400	10,300	10,400	10,600	+1.92
Monroe	109,000	118,900	126,900	131,100	+20.27
Owen	17,300	18,500	19,300	19,600	+13.29
Pike	12,500	12,100	12,000	11,800	-5.6
Sullivan	19,000	18,600	18,300	18,200	-4.21

* IBRC 1993

TABLE 2-2
LOWER WHITE RIVER CITY AND TOWN POPULATION ESTIMATES*

City/Town	Census 1990	Estimate 1996	Percent Change (1990 to 1996)
Bicknell	3,357	3,216	-4.2
Bloomfield	2,592	2,624	+1.2
Cannelburg	97	102	+5.2
Crane	216	218	+0.9
Decker	281	293	+4.3
Edwardsport	380	381	+0.3
Ellettsville	3,275	4,096	+25.1
Elnora	679	716	+5.4
Gosport	764	844	+10.5
Hazleton	357	368	+3.1
Linton	5,814	5,951	+2.4
Lyons	753	830	+10.2
Monroe City	538	552	+2.6
Montgomery	351	372	+6.0
Newberry	207	230	+11.1
Odon	1,475	1,558	+5.6
Petersburg	2,595	2,478	-4.5
Plainville	444	460	+3.6
Sandborn	455	469	+3.1
Spencer	2,609	3,015	+15.6
Stinesville	204	209	+2.5
Switz City	257	282	+9.7
Washington	10,864	10,992	+1.2
Wheatland	439	451	+2.7

* IBRC 1997

2.3 Agricultural Activities in the Lower White River Watershed

Agriculture is the dominant land use in the Lower White River Watershed. Section 2.2.1 shows that 60 percent of land cover in the watershed is agricultural vegetation. This section provides an overview of the agricultural activities in the watershed.

2.3.1 Livestock Operations

Livestock production within the watershed encompasses several species, and the overall composition changes from county to county. Hogs and cattle are produced in every county, and six counties produce significant numbers of turkeys. See Table 2-3 for livestock inventory numbers. All of the turkey producing counties are within the top 20 counties for turkey production in Indiana. Some animals are raised in open lots or pastures and some are raised in confined feeding lots or buildings.

Confined feeding is the raising of animals for food, fur or recreation in lots, pens, ponds, sheds or buildings, where they are confined, fed and maintained for at least 45 days during any year, and where there is no ground cover or vegetation present over at least half of the animals' confinement area. Livestock markets and sale barns are generally excluded (IDEM 1999).

Indiana law defines a confined feeding operation as any livestock operation engaged in the confined feeding of at least 300 cattle, or 600 swine or sheep, or 30,000 fowl, such as chickens, ducks and other poultry. The IDEM regulates these confined feeding operations, as well as smaller livestock operations which have violated water pollution rules or laws, under IC 13-18-10.

As of October 1999, there were 290 livestock producers operating under the Confined Feeding Rules in the 10 counties of the watershed (IDEM 1999). Figure 2-5 compares the animal numbers produced under Confined Feeding Permits to the USDA Agricultural Census (USDA-NASS 1997) “inventory” animals in each county.

The following factors affect the graphs in Figure 2-5:

- Livestock operations that are smaller than the state regulated numbers may not require a permit from IDEM.
- The permitted animal numbers represent the maximum facility capacity in any given 45-day period.
- The USDA “inventory” number represents the number of animals on hand the day the inventory was done, and does NOT represent the total animals produced. The USDA category for “total animals sold” will more accurately reflect total animals produced.
- Due to the various production cycles of the different species, the number of animals produced at any given permitted facility during the year may be higher or lower than the number of animals on the permit.
- There is a time lag between USDA’s 1997 inventory and IDEM’s 1999 permit numbers.

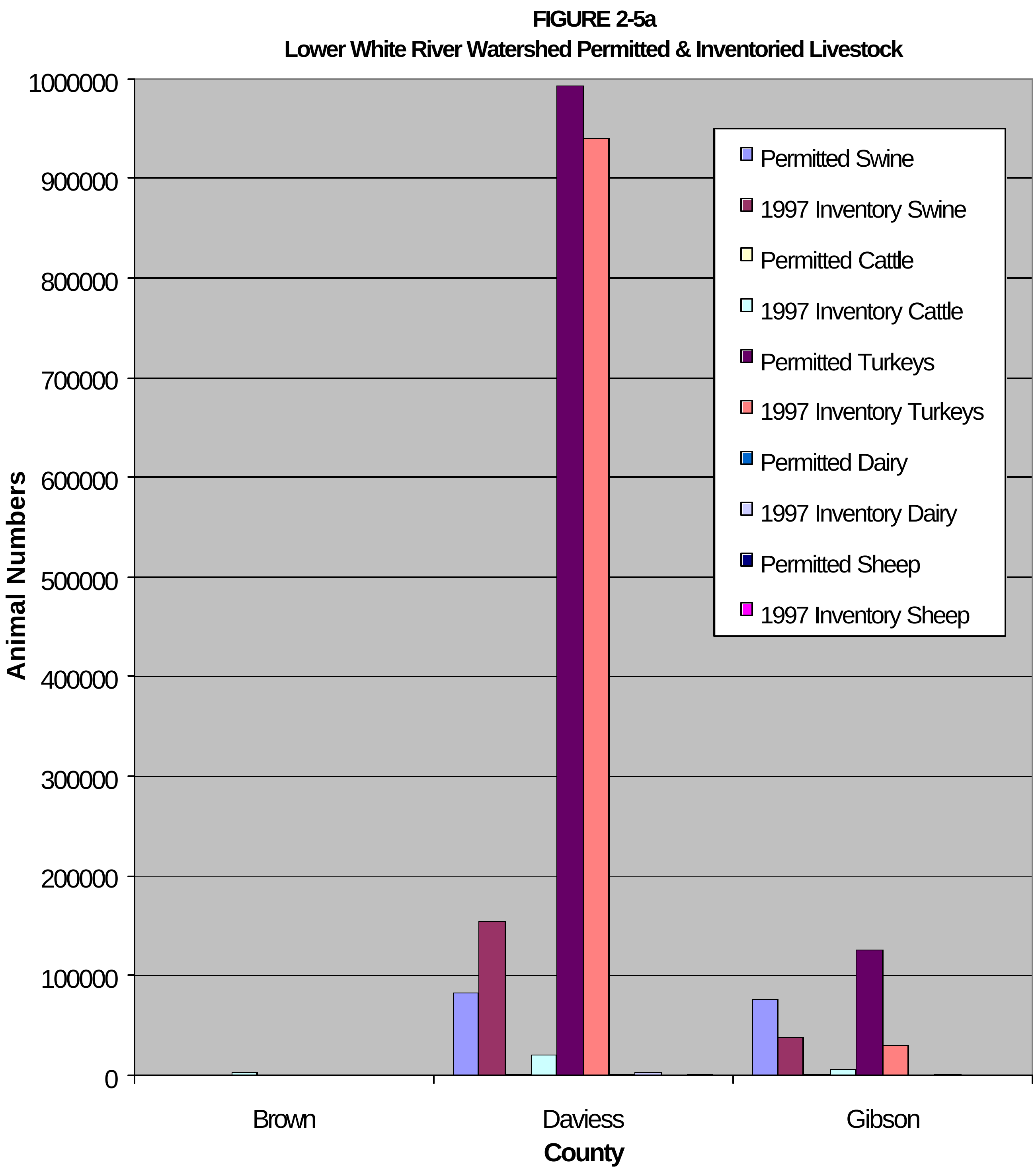


FIGURE 2-5a
Lower White River Watershed Permitted & Inventoried Livestock
Animal Numbers
1000000
900000
800000
700000
600000
500000
400000
300000
200000
100000
0
Brown
Daviess
Gibson
County
Permitted Swine
1997 Inventory Swine
Permitted Cattle
1997 Inventory Cattle
Permitted Turkeys
1997 Inventory Turkeys
Permitted Dairy
1997 Inventory Dairy
Permitted Sheep
1997 Inventory Sheep

FIGURE 2-5b
Lower White River Watershed Permitted & Inventoried Livestock

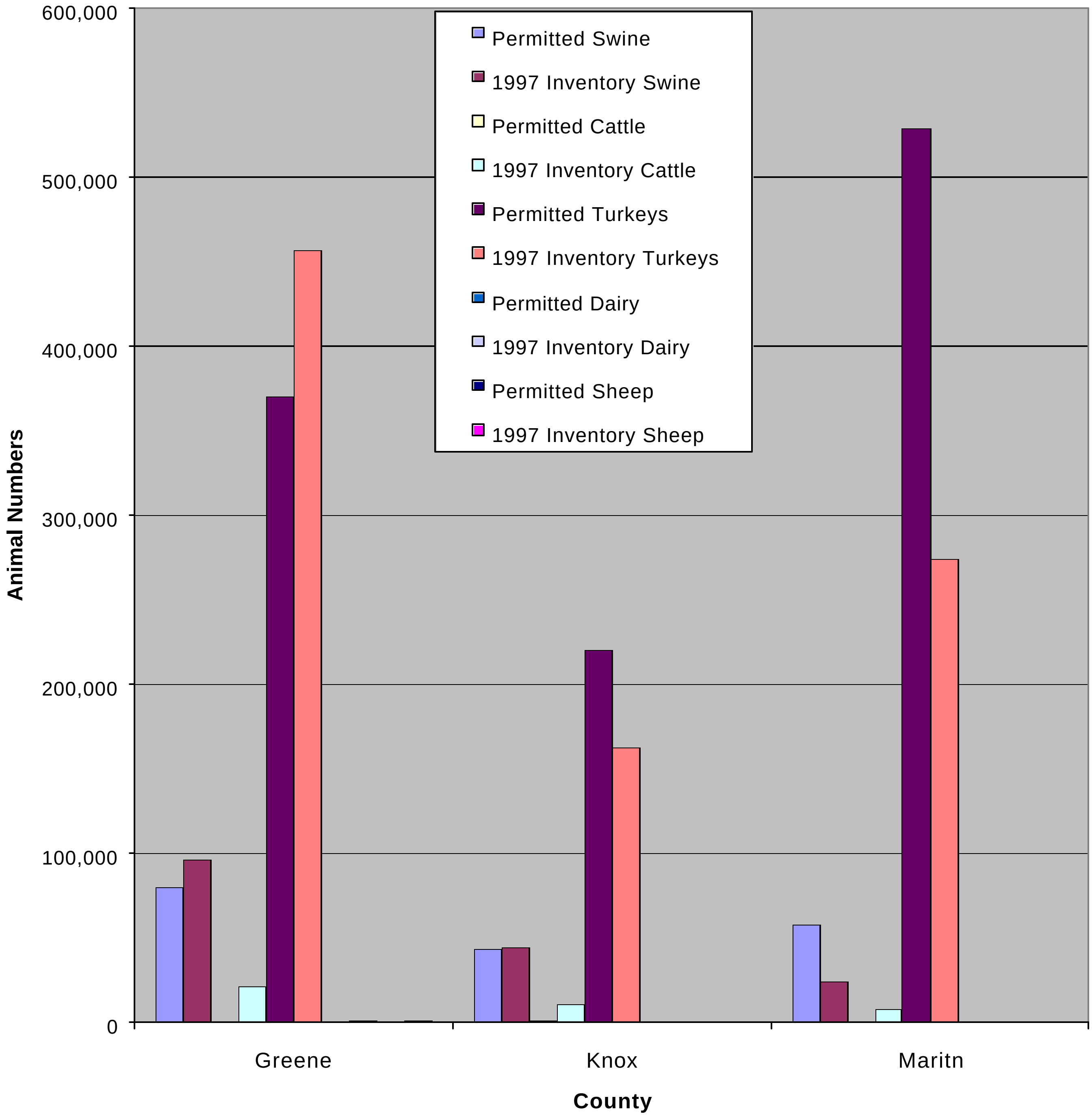
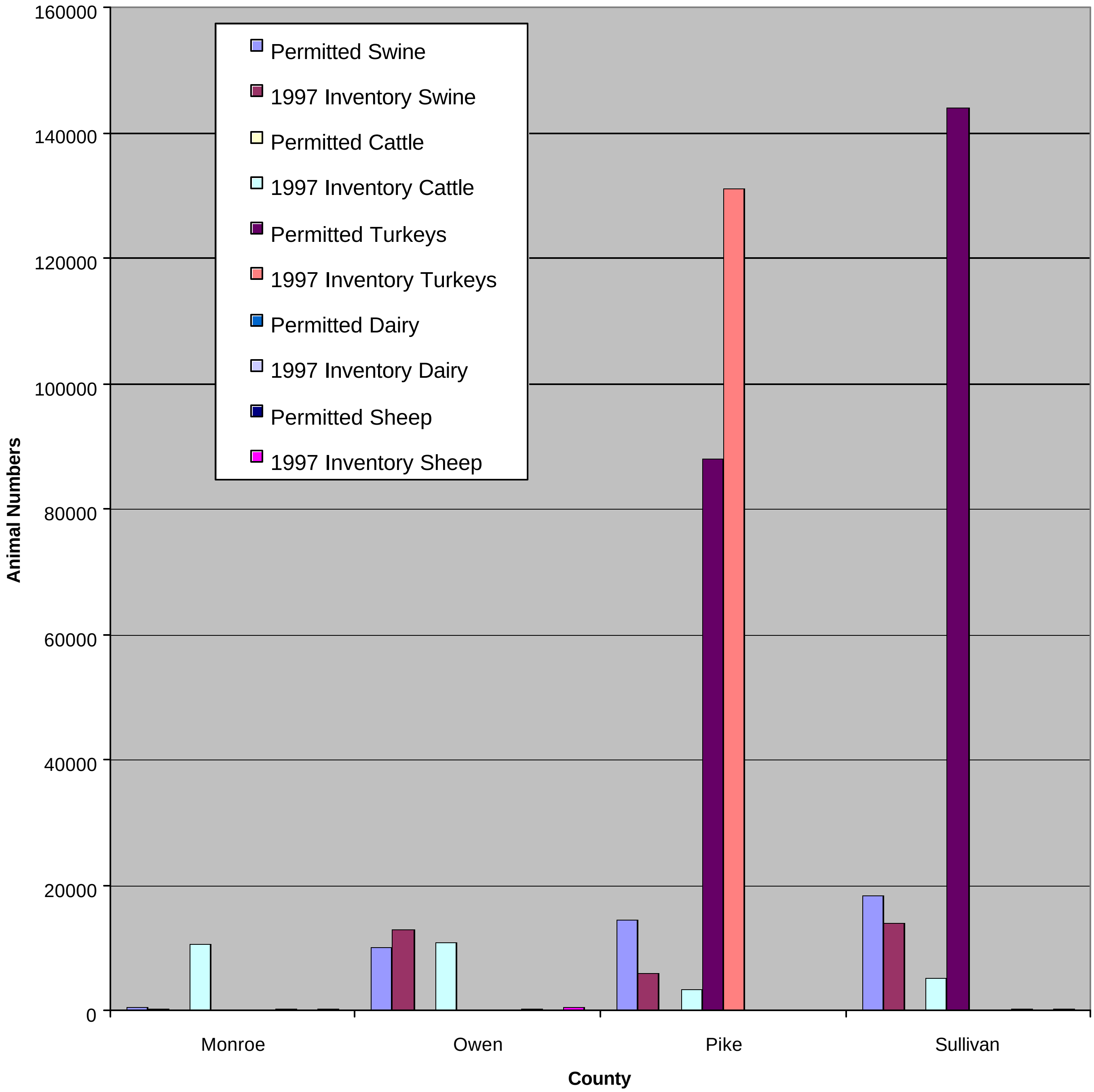


FIGURE 2-5c
Lower White River Watershed Permitted & Inventoried Livestock



2.3.2 Crop Production

As discussed previously, most of the soils of the Lower White River watershed are good for crop production. Table 2-4 lists the 1997 acres of the major crops produced in 1997 throughout the ten counties in the watershed. For 1997, total acres of corn for grain edged out total acres of soybeans as the number one crop produced in the ten counties. Corn for grain and soybeans are clearly the primary crops produced in the watershed on basis of total acres.

The adoption of no-till crop production varies greatly from county to county and by crop. On a watershed basis it is estimated that 10-20 % of the corn acres, and 30-50% of the soybean acres are planted using no-till methods (NRCS, SWCD). The Clean Water Indiana Education Programs' Residue Transect for 1998 indicates no-till adoption for soybeans in the 30-40% range, and no-till adoption for corn around 20%, when averaged for the watershed.

TABLE 2-3
LIVESTOCK IN THE LOWER WHITE RIVER WATERSHED

	1997 Livestock Inventory*							
	Hogs and pigs		Cattle and calves		Sheep and lamb		Turkeys	
County	Number	State Rank**	Number	State Rank**	Number	State Rank**	Number	State Rank**
Brown	203	92	2,087	87	@	@	@	@
Daviess	154,715	3	20,298	11	@	@	941,225	2
Gibson	38,267	36	6,620	59	197	72	@	@
Greene	96,385	12	21,561	10	1,820	3	457,100	3
Knox	44,215	32	10,379	36	@	@	163,001	7
Martin	24,716	53	8,017	50	@	@	274,000	4
Monroe	279	91	10,717	34	308	57	@	@
Owen	12,934	69	10,917	32	551	44	@	@
Pike	5,986	77	3,509	80	70	89	131,008	8
Sullivan	13,898	68	5,386	66	@	@	(D)	16

* USDA-NASS 1997

@ indicates specie is not in the top 4 for this county

** State Rank is out of a total of 92 counties in Indiana

(D) Numbers not disclosed by USDA-NASS

TABLE 2-4
CROPS PRODUCED IN THE LOWER WHITE RIVER WATERSHED

	1997 Crops*							
	Corn for grain		Soybeans for beans		Wheat		Hay crops	
County	Acres	State Rank**	Acres	State Rank**	Acres	State Rank**	Acres	State Rank**
Brown	1,840	91	1,022	91	@	@	3,221	78
Daviess	89,873	18	54,040	47	11,650	7	10,897	19
Gibson	95,804	13	85,338	16	30,044	3	4,562	60
Greene	51,262	59	44,818	58	3,272	63	21,797	6
Knox	109,195	6	107,839	3	34,287	2	4,865	57
Martin	16,105	81	12,623	83	2,165	77	6,838	34
Monroe	6,047	87	5,228	87	439	89	11,487	14
Owen	20,534	77	18,068	81	2,414	75	11,652	13
Pike	29,996	74	27,609	72	4,942	39	2,857	81
Sullivan	69,759	35	65,830	34	9,049	12	4,533	61

* USDA-NASS 1997

** State Rank is out of a total of 92 counties in Indiana

2.4 Significant Natural Areas in the Lower White River Watershed

In 1993, the Indiana Natural Resources Commission (NRC) adopted its "Outstanding Rivers" List for Indiana. This listing is referenced in the standards for utility line crossings within floodways, formerly governed by IC 14-28-2 and now controlled by 310 IAC 6-1-16 through 310 IAC 6-1-18. Except where incorporated into a statute or rule, the "Outstanding Rivers List" is intended to provide guidance rather than to have regulatory application (NRC 1997). To help identify the rivers and streams which have particular environmental or aesthetic interest, a special listing has been prepared by IDNR's Division of Outdoor Recreation. This listing is a corrected and condensed version of a list compiled by American Rivers and dated October 1990. The NRC has adopted the IDNR listing as an official recognition of the resource values of these waters. A river included in the "Outstanding Rivers List" qualifies under one or more of 22 categories. Table 2-5 presents the rivers in the Lower White River watershed which are on the "Outstanding Rivers List" and their significance.

The entire West Fork White River is included in the Canoeing Guide published by IDNR, Division of Outdoor Recreation Complete details on the overall trip can be found at: http://www.state.in.us/dnr/outdoor/canoegui/whitewes.htm

TABLE 2-5
WATERS OF THE LOWER WHITE RIVER WATERSHED ON THE OUTSTANDING RIVERS LIST FOR INDIANA*

River Segment	County	Significance
West Fork White River, from Farmland to confluence with the Wabash River	Daviess, Delaware, Gibson, Knox, Greene, Hamilton, Madison, Marion, Morgan, Owen, Randolph	5, 11, 13

Significance of numbering system:

5. Nationwide Rivers Inventory Rivers. The 1,524 river segments identified by the National Park Service in its 1982 "Nationwide Rivers Inventory" as qualified for consideration for inclusion in the National Wild and Scenic Rivers System.

11. State Heritage Program Sites. Rivers identified by state natural heritage programs or similar state programs as having outstanding ecological importance.

13. Canoe Trails. State-designated canoe/boating routes.

*NRC 1997

State Forests, Parks, and Wildlife Areas

The Lower White River watershed contains five state properties, which serve as natural or recreation areas.

Greene-Sullivan State Forest is located north of Pleasantville along State Road 159. It consists of 8,000 acres of former coalmine land in Greene and Sullivan counties. Greene-Sullivan was founded in 1936 when various coal companies donated more than 3,000 acres of property to the Department of Natural Resources, Division of Forestry. But that was just the beginning. Now the forest boasts almost 8,000 acres of beautiful woodland and rolling hills dotted with more than 120 lakes, making it one of the most unique areas in Indiana. Other favorite activities include hunting, picnicking, mushroom hunting, horseback riding, photography and wildlife viewing. Primitive camping is available. There is a picnic table and grill located on each of the 100 family campsites of Narrow Lake, Wampler Lake and Reservoir #26. Twenty additional sites for horse campers are available in the Horseman's Campground near Ladder Lake. In addition, Greene-Sullivan offers an archery range, which the DNR Division of Forestry maintains in cooperation with a local archery club. This range features a shelterhouse, four practice targets at marked distances, and 15 targets scattered along a woodchipped trail to simulate hunting conditions.

A small portion of the 23,326 acres of **Yellowwood State Forest** is within the watershed. Yellowwood is located south of Needmore along State Road 45 in Brown County. Yellowwood State Forest was created in 1940 when federal land was leased to the State of Indiana. The land was deeded to the state in 1956. Prior to that time, the Civilian Conservation Corps and Works Project Administration completed three lakes, a shelterhouse and a residence, all presently in use. Over 2,000 abandoned and eroded acres were planted to pine, black locust, black walnut, white and red oak. Yellowwood Lake was completed in 1939. The 133-acre lake is about 30 feet deep. In 1994, 30 acres slated for the construction of a radio tower were purchased and became part of Yellowwood State Forest. A 36-acre parcel was purchased and added to Yellowwood in 1995.

There are 80 designated primitive campsites and a Horsemen's Camp with 10 sites. There are also several hiking trails and three horse trails. The 133-acre Yellowwood Lake offers excellent fishing. A boat launch is located at the south end of the lake. Bear Lake and Crooked Creek Lake are also popular recreation and fishing areas on the forest property. Hunting is allowed on the property.

Panning for gold is permitted on Morgan-Monroe and Yellowwood State Forests. The displacement of any material through use of a pick, shovel or sluice is not allowed due to concern for water quality.

Yellowwood State Forest is named for a tree common in the mid-south but rare this far north. The yellowwood tree (Cladrastis kentukea) has bright yellow heartwood that is hard and dense. The tree flowers abundantly but only every three to five years in the spring with loose clusters of pea-like, fragrant white flowers. Seeds are in bean pods similar to its cousin the black locust. The leaves are compound and the bark is similar to the American beech. Less than 200 acres in Yellowwood support the yellowwood tree on north facing slopes and deep ravines near Crooked Creek Lake. A specimen is planted at the Forest Office on Yellowwood Lake Road.

Morgan-Monroe State Forest lies along the Morgan-Monroe county line. The forest is 24,000 acres, and about half of it is located in the Lower White watershed. This portion lies in the northeast corner of Monroe County, and drains toward Beanblossom Creek. The forestland encompasses many steep ridges and valleys, and is forested with some of the state's finest hardwoods. The original settlers of the area cleared and attempted to farm the ridges, but were frustrated by rocky soil unsuitable for agriculture. The state purchased the eroded, abandoned land to create Morgan-Monroe State Forest beginning in 1929. Primitive camping is available on 21 sites. Three forest lakes, Bryant Creek Lake (9 acres), Cherry Lake (4 acres) and Prather Lake (4 acres) are all open to fishing. Boat ramps are located on Bryants Creek and Cherry Lakes. Hunting is allowed on the property. Eight hiking trails of various length and difficulty are available. Panning for gold is permitted on Morgan-Monroe and Yellowwood State Forests. Displacement of any material through use of a pick, shovel or sluice is not allowed due to concern for water quality (IDNR, 1999).

McCormick's Creek State Park is located in Owen County, east of Spencer along State Road 46. Unique limestone formations and scenic waterfalls are some of the beautiful highlights at Indiana's first state park, McCormick's Creek. You'll find this park along the White River, 14 miles northwest of Bloomington. Hike through the thick woods or roam through the magnificent canyon surrounded by high cliffs. You'll notice the well-manicured grounds, which were planted by the original owner and are being preserved to sustain the tranquil environment he created. Facilities include: family cabins, 189 Class A and 100 class C camping sites, hiking trails, inn accommodations, restaurant, nature center, picnicking, saddle barn, and swimming.

Hillenbrand Fish and Wildlife Area is located in Greene County between Midland and Vicksburg along Greene County Road 700 N. The property lies east and west of State Road 59 and north and south of County Road 700 N. Hillenbrand is 3,400 acres of wildlife habitat where fishing and hunting are allowed. There are no campgrounds or picnic areas. Hillenbrand is managed through IDNR's Minnehaha Fish and Wildlife Area office in Sullivan County.

Other Natural Areas

The Natural Resources Conservation Service (NRCS) recently obtained easements, under its Wetland Reserve Program (WRP), which will restore 7,036 acres of former wetlands. The easement areas are located in two parcels south of Linton in Greene County. The easements are in the Black Creek watershed basin. The largest parcel was known throughout the area as "Goose Pond". The restoration of these areas will provide habitat for many species of wildlife and plants. At this time both parcels are private land and do not have public access.

The Nature Conservancy is the world's leading private, international conservation group. The Nature Conservancy's mission is to preserve plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive. In their effort to fulfil that mission the Nature Conservancy has been instrumental in setting aside many parcels in southwest Indiana. Some of the following properties are located in the Lower White watershed:

Spencer County: Bloomfield Barrens (Post Oak Barrens)
Owen County: Green's Bluff, Hoot Woods, Jordan Seeps, Lieber Recreational Area
Monroe County: Cedar Bluffs
Martin County: Bluffs of Beaver Bend, Wayne and Dorothy Ritter Nature Preserve
Knox County: George Harrison Hoke Memorial Woods
Daviess County: Thousand Acre Woods
Brown County: Browning Hill, Hitz-Rhodehamel Woods, Whip-poor-will Woods
(The Nature Conservancy, 2000)

Federal Lands

A small portion of the Hoosier National Forest lies within the Lower White River watershed. The Hoosier National Forest is managed by the U.S. Department of Agriculture's, Forest Service.

The Naval Surface Warfare Center, Crane Division is vitally concerned with the conservation of the natural environment, both on and off the installation. These efforts have been recognized by the Navy, and the Department of Defense with awards for excellence in natural resources management. In 1995 and 1996, Crane won the chief of Naval Operations Award for the best natural resources program. To share its abundant natural beauty with its neighbors, Crane has opened its 800 acre Lake Greenwood to the public for fishing and boating.

Crane provides stewardship to over 62,000 acres of land, which about 49,000 acres are forested. The primary purpose of most of this forested land is to act as a buffer or safety zone for the materials stored at Crane. This is the largest forested tract of land in Indiana under a single ownership and has and will hopefully continue to be an important part of the Indiana ecosystem. The Crane forest has been important to the re-establishment of deer, turkey, ruffed grouse and eagles in Indiana. Both Purdue University and Indiana University conduct wildlife research at Crane.

The Crane forest is also a working forest where timber is harvested. Profits from the sale of these timber products are shared with county government. It is important to note that only about 21 percent of the annual growth is currently being harvested, so our forests continue to grow.

Our overall goal is to manage the natural resources at Crane to best benefit the United States and its citizens (Naval Surface Warfare Center, Crane Division, 2000).
http://www.crane.navy.mil/nat_res/index.htm

Wildlife

All counties in the Lower White watershed are listed as potential habitat for the endangered Indiana bat (*Myotis sodalis*), and the threatened Bald eagle (*Haliaeetus leucophalus*). Additional threatened and endangered species are listed in Table 2-6.

Table 2-6
Threatened and Endangered Species in the Watershed

County	Specie	**Status**
All counties	Indiana bat (*Myotis sodalis*) Bald eagle (*Haliaeetus leucocephalus*)	Endangered Threatened
Gibson	Least Tern; interior population *(Sterna antillarum athalassos)* Fat pocketbook *(Potamilus capax)* Ring Pink *(Obovaria retusa)* Tubercled-blossom pearlymussel *(Epioblasma torulosa torulosa)*	Endangered Endangered Endangered Endangered; possibly extirpated
Knox	Fat pocketbook *(Potamilus capax)* Ring Pink *(Obovaria retusa)* Rough pigtoe *(Pleurobema plenum)* Tubercled-blossom pearlymussel *(Epioblasma torulosa torulosa)*	Endangered Endangered Endangered Endangered; possibly extirpated
Martin	Fanshell pearly mussel *(Cyprogenia stegaria)* Rough pigtoe *(Pleurobema plenum)*	Endangered Endangered
Sullivan	Fanshell pearly mussel *(Cyprogenia stegaria)* Ring Pink *(Obovaria retusa)* Rough pigtoe *(Pleurobema plenum)* Tubercled-blossom pearlymussel *(Epioblasma torulosa torulosa)*	Endangered Endangered Endangered Endangered; possibly extirpated

Source: United States Fish and Wildlife Service, *County List of Federal Threatened, Endangered, and Proposed Species (February 1998),* http://www.fws.gov/r3pao/eco_serv/endangrd/lists/indiana.html, 1999.

2.5 Surface Water Use Designations and Classifications

The following uses are designated by the Indiana Water Pollution Control Board (327 IAC 2-1-3):

- Surface waters of the state are designated for full-body contact recreation during the recreational season (April through October).
- All waters, except limited use waters, will be capable of supporting a well-balanced, warm water aquatic community.
- All waters, which are used for public or industrial water supply, must meet the standards for those uses at the point where water is withdrawn.
- All waters, which are used for agricultural purposes, must meet minimum surface water quality standards.
- All waters in which naturally poor physical characteristics (including lack of sufficient flow), naturally poor or reversible man-induced conditions, which came into existence prior to January 1, 1983, and having been established by use attainability analysis, public comment period, and hearing may qualify to be classified for limited use and must be evaluated for restoration and upgrading at each triennial review of this rule.
- All waters, which provide unusual aquatic habitat, which are an integral feature of an area of exceptional natural beauty or character, or which support unique assemblages of aquatic organisms may be classified for exceptional use.

All waters of the state, at all times and at all places, including the mixing zone, shall meet the minimum conditions of being free from substances, materials, floating debris, oil, or scum attributable to municipal, industrial, agricultural, and other land use practices, or other discharges:

- that will settle to form putrescent or otherwise objectionable deposits,
- that are in amounts sufficient to be unsightly or deleterious,
- that produce color, visible oil sheen, odor, or other conditions in such degree as to create a nuisance,
- which are in amounts sufficient to be acutely toxic to, or to otherwise severely injure or kill aquatic life, other animals, plants, or humans, or
- which are in concentrations or combinations that will cause or contribute to the growth of aquatic plants or algae to such degree as to create a nuisance, be unsightly, or otherwise impair designated uses.

2.5.1 Surface Water Classifications in the Lower White River Watershed

The statewide classifications discussed in Section 2.5 apply to all stream segments in the Lower White River watershed. The following streams have been identified and designated as limited use streams under 327 IAC 2-1-11(a). Prides Creek in Pike County, upstream from its confluence with White River, and an unnamed tributary of Four Mile Creek in Greene County, from the Lyons sewage treatment plant to its confluence with Four Mile Creek.

2.6 US Geological Survey Water Use Information for the Lower White River Watershed

The U.S. Geological Survey's (USGS) National Water-Use Information Program is responsible for compiling and disseminating the nation's water-use data. The USGS works in cooperation with local, State, and Federal environmental agencies to collect water-use information at a site-specific level. USGS also compiles the data from hundreds of thousands of sites to produce water-use information aggregated up to the county, state, and national levels. Every five years, data at the state and hydrologic region level are compiled into a national water-use data system. Table 2-6 shows the USGS Water-Use information for the Lower White River Watershed for 1990 and 1995.

TABLE 2-6
1990 & 1995 Water Use Information for the Lower White River Watershed

Population and Water Use totals	1990	1995
Total population in the watershed (thousands)	168.45	132.09
Public Water Supply	**1990**	**1995**
Population served by public groundwater supply (thousands)	57.32	58.4
Population served by surface water supply (thousands)	77.28	47.13
Total population served by public water supply (thousands)	134.6	105.53
Total groundwater withdrawals (mgd)	7.37	8.55
Total surface water withdrawals (mgd)	1.11	0.69
Total water withdrawals (mgd)	8.48	9.24
Total per capita withdrawal (gal/day)	63	87.56
Population self-supplied with water (thousands)	33.85	26.56
Commercial Water Use	**1990**	**1995**
Groundwater withdrawal for commercial use (mgd)	0.01	0
Surface water withdrawal for commercial use (mgd)	0.78	0.71
Deliveries from public water supplies for commercial use (mgd)	2.43	1.62
Total commercial water use (mgd)	3.22	2.33
Industrial Water Use	**1990**	**1995**
Groundwater withdrawal for industrial use (mgd)	0	0.06
Surface water withdrawals for industrial use (mgd)	1.46	0.82
Deliveries from public water suppliers for industrial use (mgd)	1.48	1.61
Total industrial water use (mgd)	2.94	2.49
Agricultural Water Use	**1990**	**1995**
Groundwater withdrawals for livestock use (mgd)	1.06	1.32
Surface water withdrawals for livestock use (mgd)	1.01	0.95
Total livestock water use (mgd)	2.07	2.27
Groundwater withdrawals for irrigation (mgd)	0.16	0.92
Surface water withdrawals for irrigation (mgd)	14.21	13.35
Total irrigation water use (mgd)	14.37	14.27
Mining Use	**1990**	**1995**
Groundwater withdrawals	0.16	0.6
Surface water withdrawals	1.51	6.64
Total withdrawals (mgd)	1.67	7.24
Thermoelectric Power Use	**1990**	**1995**
Groundwater withdrawal for electric generation (mgd)	1.88	2.1
Surface water withdrawal for electric generation (mgd)	520.9	515.34
Deliveries from public water supplies for electric generation (mgd)	0	0
Total withdrawals for electric generation (mgd)	522.78	517.44

Notes:
mgd million gallon per day
gal/day gallon per day

- The water-use information presented in this table was compiled from information provided in the U.S. Geological Survey's National Water-Use Information Program data system for 1990 and 1995. The National Water-Use Information Program is responsible for compiling and disseminating the nation's water-use data. The U.S. Geological Survey works in cooperation with local, State, and Federal environmental agencies to collect water-use information at a site-specific level. Every five years, the U.S. Geological Survey compiles data at the state and hydrologic region level into a national water-use data system and are published in a national circular.

2.7 Other Significant Land Uses

Other land uses in the watershed that may be significant, in terms of both environmental and economic impacts, are coal mining, sand and gravel mining, and power generation.

There are four existing electric power-generating stations within the watershed. IP&L and Hoosier Energy both have coal-fired plants located adjacent to the White River at Petersburg. Cinergy has a plant located at Edwardsport, and Enron Corp has a gas fired plant east of Wheatland. Currently, a gas-fired plant is under construction by Matrix Power at Worthington.

Surface coal mining has disturbed many acres in Owen, Greene, Knox, Daviess, and Sullivan counties. Prior to 1941 there was no requirement to reclaim or restore mined land and many mine sites were just abandoned when mining ceased. The State of Indiana passed a law in 1941, requiring the planting of trees on spoil banks.

By 1967, the Indiana law had realized a major revision including provisions for the planting of farm crops, hay and grasses on mined land; requirements that certain acid-forming rocks and other materials be buried; and areas reclaimed for agriculture were to be accessible by farm machinery. In addition, operators had to do advanced planning for use of the land after mining was completed. Standards were established for the creation of lakes and leveling peaks and ridges caused by rock and soil removal. It was the first law in the nation to require rules for grading mined land to specific contours.

Current mining activities fall under the 1977 Surface Mining Control and Reclamation Act (SMCRA). Besides establishing stringent national standards for coal mining and reclamation, the Act created the federal Department of Interior's Office of Surface Mining Reclamation and Enforcement (OSMRE). The Abandoned Mine Reclamation Fund was created by SMCRA to reclaim mined lands that had been inadequately restored or abandoned before passage of the Act of 1977. (http://www.state.in.us/dnr/reclamation/education.html)

Coalmines tend to be large tracts, and are obvious on the landscape. Some of the old sites have had problems with soil erosion or acid drainage that can cause water quality concerns.

There are several sand and gravel extraction operations within the watershed. Most of these operations are located adjacent to the White River channel where shallow sand and gravel deposits can be removed economically. Water quality concerns may be significant since operations are typically within the floodway of the river and excavating equipment is often working within the groundwater.

3 Causes and Sources of Water Pollution

A number of substances including nutrients, bacteria, oxygen-demanding wastes, metals, and toxic substances, cause water pollution. Sources of these pollution-causing substances are divided into two broad categories: point sources and nonpoint sources. Point sources are typically piped discharges from wastewater treatment plants, large urban and industrial stormwater systems, and other facilities. Nonpoint sources can include atmospheric deposition, groundwater inputs, and runoff from urban areas, agricultural lands and others. Chapter 3 includes the following:

Section 3.1 Causes of Pollution
Section 3.2 Point Sources of Pollution
Section 3.3 Nonpoint Sources of Pollution

3.1 Causes of Pollution

'Causes of pollution' refer to the substances which enter surface waters from point and nonpoint sources and result in water quality degradation and impairment. Major causes of water quality impairment include biochemical oxygen demand (BOD), nutrients, toxicants (such as heavy metals, polychlorinated biphenyls [PCBs], chlorine, pH and ammonia) and E. coli bacteria. Table 3-1 provides a general overview of causes of impairment and the activities that may lead to their introduction into surface waters. Each of these causes is discussed in the following sections.

TABLE 3-1
CAUSES OF WATER POLLUTION AND CONTRIBUTING ACTIVITIES

Cause	Activity associated with cause
Nutrients	Fertilizer on agricultural crops and residential/ commercial lawns, animal wastes, leaky sewers and septic tanks, direct septic discharge, atmospheric deposition, wastewater treatment plants
Toxic Chemicals	Pesticide applications, disinfectants, automobile fluids, accidental spills, illegal dumping, urban stormwater runoff, direct septic discharge, industrial effluent
Oxygen-Consuming Substances	Wastewater effluent, leaking sewers and septic tanks, direct septic discharge, animal waste
E. coli	Failing septic systems, direct septic discharge, animal waste (including runoff from livestock operations and impacts from wildlife), improperly disinfected wastewater treatment plant effluent

3.1.1 E. coli Bacteria

E. coli bacteria are associated with the intestinal tract of warm-blooded animals. They are widely used as an indicator of the potential presence of waterborne disease-causing (pathogenic) bacteria, protozoa, and viruses because they are easier and less costly to detect than the actual pathogenic organisms. The presence of waterborne disease-causing organisms can lead to outbreaks of such diseases as typhoid fever, dysentery, cholera, and cryptosporidiosis. The detection and identification of specific bacteria, viruses, and protozoa, (such as Giardia, Cryptosporidium, and Shigella) require special sampling protocols and very sophisticated laboratory techniques which are not commonly available.

E. coli water quality standards have been established in order to ensure safe use of waters for water supplies and recreation. 327 IAC 2-1-6 Section 6(d) states that *E. coli* bacteria, using membrane filter count (MF), shall not exceed 125 per 100 milliliters as a geometric mean based on not less than five samples equally spaced over a 30 day period nor exceed 235 per 100 milliliters in any one sample in a 30 day period.

E. coli bacteria may enter surface waters from nonpoint source runoff, but they also come from improperly treated discharges of domestic wastewater. Common potential sources of *E. coli* bacteria include leaking or failing septic systems, direct septic discharge, leaking sewer lines or pump station overflows, runoff from livestock operations, urban stormwater and wildlife. *E. coli* bacteria in treatment plant effluent are controlled through disinfection methods including chlorination (often followed by dechlorination), ozonation or ultraviolet light radiation.

3.1.2 Toxic Substances

327 IAC 2-1-9(45) defines toxic substances as substances, which are or may become harmful to plant or animal life, or to food chains when present in sufficient concentrations or combinations. Toxic substances include, but are not limited to, those pollutants identified as toxic under Section 307 (a)(1) of the Clean Water Act. Standards for individual toxic substances are listed 327 IAC 2-1-6. Toxic substances frequently encountered include chlorine, ammonia, organics (hydrocarbons and pesticides) heavy metals and pH. These materials are toxic to different organisms in varying amounts, and the effects may be evident immediately or may only be manifested after long-term exposure or accumulation in living tissue.

Whole effluent toxicity testing is required for major NPDES dischargers (discharge over 1 million gallons per day or population greater than 10,000). This test shows whether the effluent from a treatment plant is toxic, but it does not identify the specific cause of toxicity. If the effluent is found to be toxic, further testing is done to determine the specific cause. This follow-up testing is called a toxicity reduction evaluation. Other testing, or monitoring, done to detect aquatic toxicity problems include fish tissue analyses, chemical water quality sampling and assessment of fish community and bottom-dwelling organisms such as aquatic insect larvae. These monitoring programs are discussed in Chapter 4.

Each of the substances below can be toxic in sufficient quantity or concentration.

Metals

Municipal and industrial dischargers and urban runoff are the main sources of metal contamination in surface water. Indiana has stream standards for many heavy metals, but the most common ones in municipal permits are cadmium, chromium, copper, nickel, lead, mercury, and zinc. Standards are listed in 327 IAC 2-1-6. Point source discharges of metals are controlled through the National Pollution Discharge Elimination System (NPDES) permit process. Mass balance models are employed to determine allowable concentrations for a permit limit. Municipalities with significant industrial users discharging wastes to their treatment facilities limit the heavy metals from these industries through a pretreatment program. Source reduction and wastewater recycling at waste water treatment plants (WWTP) also reduces the amount of metals being discharged to a stream. Nonpoint sources of pollution are controlled through best management practices.

In Indiana, as well as many other areas of the country, mercury contamination in fish has caused the need to post widespread fish consumption advisories. The source of the mercury is unclear; however, atmospheric sources are suspected and are currently being studied.

Polychlorinated biphenyls (PCBs)

Polychlorinated biphenyls (PCBs) were first created in 1881 and subsequently began to be commercially manufactured around 1929 (Bunce 1994). Because of their fire-resistant and insulating properties, PCBs were widely used in transformers, capacitors, and in hydraulic and heat transfer systems. In addition, PCBs were used in products such as plasticizers, rubber, ink, and wax. In 1966, PCBs were first detected in wildlife, and were soon found to be ubiquitous in the environment (Bunce 1994). PCBs entered the environment through unregulated disposal of products such as waste oils, transformers, capacitors, sealants, paints, and carbonless copy paper. In 1977, production of PCBs in North America was halted. Subsequently, the PCB contamination present in our surface waters and environment today is the result of historical waste disposal practices.

Ammonia (NH_3)

Point source dischargers are one of the major sources of ammonia. In addition, discharge of untreated septic effluent, decaying organisms which may come from nonpoint source runoff and bacterial decomposition of animal waste also contribute to the level of ammonia in a waterbody. Standards for ammonia are listed in 327 IAC 2-1-6.

3.1.3 Oxygen-Consuming Wastes

Oxygen-consuming wastes include decomposing organic matter or chemicals, which reduce dissolved oxygen in water through chemical reactions. Raw domestic wastewater contains high concentrations of oxygen-consuming wastes that need to be removed from the wastewater before it can be discharged into a waterway. Maintaining a sufficient level of dissolved oxygen in the water is critical to most forms of aquatic life.

The concentration of dissolved oxygen in a water body is one indicator of the general health of an aquatic ecosystem. 327 IAC Section 6 (b)(3) states that concentrations of dissolved oxygen shall average at least five milligrams per liter per calendar day and shall not be less than four milligrams per liter at any time. Dissolved oxygen concentrations are affected by a number of factors. Higher dissolved oxygen is produced by turbulent actions, such as waves, which mix air and water. Lower water temperatures also generally allows for retention of higher dissolved oxygen concentrations. Low dissolved oxygen levels tend to occur more often in warmer, slow-moving waters. In general, the lowest dissolved oxygen concentrations occur during the warmest summer months and particularly during low flow periods.

Sources of dissolved oxygen depletion include wastewater treatment plant effluent, the decomposition of organic matter (such as leaves, dead plants and animals) and organic waste matter that is washed or discharged into the water. Sewage from human and household wastes is high in organic waste matter. Bacterial decomposition can rapidly deplete dissolved oxygen levels unless these wastes are adequately treated at a wastewater treatment plant. In addition, excess nutrients in a water body may lead to an over-abundance of algae and reduce dissolved oxygen in the water through algal respiration and decomposition of dead algae. Also, some chemicals may react with and bind up dissolved oxygen. Industrial discharges with oxygen consuming wasteflow may be resilient instream and continue to use oxygen for a long distance downstream.

3.1.4 Nutrients

The term “nutrients” in this Strategy refers to two major plant nutrients, phosphorus and nitrogen. These are common components of fertilizers, animal and human wastes, vegetation, and some industrial processes. Nutrients in surface waters come from both point and nonpoint sources. Nutrients are beneficial to aquatic life in small amounts. However, in over-abundance and under favorable conditions, they can stimulate the occurrence of algal blooms and excessive plant growth in quiet waters or low flow conditions. The algal blooms and excessive plant growth often reduce the dissolved oxygen content of surface waters through plant respiration and decomposition of dead algae and other plants. This is accentuated in hot weather and low flow conditions because of the reduced capacity of the water to retain dissolved oxygen.

3.2 Point Sources of Pollution

As discussed previously, sources of water pollution are divided into two broad categories: point sources and nonpoint sources. This section focuses on point sources. Section 3.3.1 defines point sources and Section 3.3.2 discusses point sources in the Lower White River Watershed.

3.2.1 Defining Point Sources

Point sources refer to discharges that enter surface waters through a pipe, ditch or other well-defined point of discharge. The term applies to wastewater and stormwater discharges from a variety of sources. Wastewater point source discharges include municipal (city and county) and industrial wastewater treatment plants and small domestic wastewater treatment systems that may serve schools, commercial offices, residential subdivisions and individual homes. Stormwater point source discharges include stormwater collection systems for medium and large municipalities which serve populations greater than 100,000 and stormwater discharges associated with industrial activity as defined in the Code of Federal Regulations (40 CFR 122.26(a)(14)). The primary pollutants associated with point source discharges are Oxygen demanding wastes, nutrients, sediment, color and toxic substances including chlorine, ammonia and metals.

Point source dischargers in Indiana must apply for and obtain a National Pollutant Discharge Elimination System (NPDES) permit from the state. Discharge permits are issued under the NPDES program, which is delegated to Indiana by the US Environmental Protection Agency (EPA). See Chapter 5 for a description of the NPDES program and permitting strategies.

3.2.2 Point Source Discharges in the Lower White River Watershed

As of June 1999, there were 85 active NPDES permits within the Lower White River watershed (Table 3-2, Figure 3-1), seventy-eight are considered minor dischargers, while 7 are considered major dischargers. See Chapter 5 for definition of minor and major dischargers.

Another point source covered by NPDES permits is combined sewer overflows (CSO). A combined sewer system is a wastewater collection system that conveys sanitary wastewater (domestic, commercial and industrial wastewater) and stormwater through a single-pipe system to a Publicly Owned Treatment Works. A CSO is the discharge from a combined sewer system at a point prior to the Publicly Owned Treatment Works. CSOs are point sources subject to NPDES permit requirements including both technology-based and water quality-based requirements of the Clean Water Act.

There are six CSOs that discharge into the watershed. All six are located in the town of Washington and drain into Hawkins Creek.

In addition to the NPDES permitted dischargers in the watershed, there may be many unpermitted, illegal discharges to the Lower White River system. Illegal discharges of residential wastewater (septic tank effluent) to streams and ditches from straight pipe discharges and old inadequate systems are a problem within the watershed (Cale, 2000; Birkhimer, 2000; Luczynski, 2000).

Table 3-2
NPDES PERMITTED FACILITIES
LOWER WHITE RIVER WATERSHED

NPDES	Facility Name	Maj / Mi	City	County	Status
ING040001	Black Beauty Coal, Viking Mine	Minor	Montgomery	Daviess	Inactive
ING040002	Beech Coal Co., Sycamore Mine	Minor	Bicknell	Knox	Active
ING040010	Peabody Coal, Hawthorn Mine	Minor	Carlisle	Sullivan	Active
ING040011	Peabody Coal, Latta Mine	Minor		Greene	Active
ING040014	IDNR Site 1041, Prairie Creek	Minor	Odon	Daviess	Inactive
ING040022	Solar Sources, Carbondale Prep	Minor	Petersburg	Pike	Active
ING040023	Solar Sources, Prides Creek Mine	Minor	Petersburg	Pike	Active
ING040024	Solar Sources, Monroe City Mine	Minor	Monore City	Knox	Inactive
ING040026	Solar Sources, Cannelburg Mine	Minor	Cannelburg	Daviess	Active
ING040028	Solar Sources, Bowman Mine	Minor	Petersburg	Pike	Active
ING040030	Triad Mining, Freelandville Mine	Minor	Edwardsport	Knox	Active
ING040034	Black Beauty Coal, Prairie Ck	Minor	Montgomery	Daviess	Active
ING040035	Black Beauty Coal, Air Qual #1	Minor	Wheatland	Knox	Active
ING040036	Black Beauty Coal, Air Qual #2	Minor	Wheatland	Knox	Active
ING040049	Phoenix Nr, Odon IIi Railsiding	Minor	Odon	Daviess	Inactive
ING040052	Phoenix Nr, Odon I Railsiding	Minor	Odon	Daviess	Inactive
ING040053	Black Beauty Coal, Blance #1	Minor	Switz City	Greene	Active
ING040054	Black Beauty Coal, Black Cr Mn	Minor	Linton	Greene	Active
ING040055	Black Beauty Coal, Miller Cr M	Minor	Switz City	Greene	Active
ING040056	Black Beauty Coal, Apraw #4 Mn	Minor	Wheatland	Knox	Active
ING040057	Black Beauty Coal, Arlen #1 Mn	Minor	Plainville	Daviess	Active
ING040058	Black Beauty Coal, Thompson Cr	Minor	Montgomery	Daviess	Active
ING040073	Foertsch Constr Little Sandy 1	Minor	Montgomery	Daviess	Active
ING040074	Foertsch Constr Little Sandy 2	Minor	Raglesville	Daviess	Inactive
ING040075	Foertsch Constr Little Sandy 3	Minor	Cannelburg	Daviess	Active
ING040076	Foertsch Constr Little Sandy 5	Minor	Raglesville	Daviess	Active
ING040077	Foertsch Constr Little Sandy 6	Minor	Odon	Daviess	Active
ING040078	Foertsch Constr Little Sandy 7	Minor	Montgomery	Daviess	Inactive
ING040079	Foertsch Constr Little Sandy 8	Minor	Montgomery	Daviess	Inactive
ING040084	Davco East Dock Corporation	Minor	Odon	Daviess	Active
ING040090	Indiana Farms Inc., Pride Mine	Minor	Petersburg	Knox	Inactive
ING040092	Black Beauty Coal, Lyons Mine	Minor	Lyons	Greene	Active
ING040093	Black Beauty Coal, Owen Mine	Minor	Switz City	Greene	Active
ING040098	Atlas Coal, Atlas #1 Mine	Minor	Jasonville	Greene	Active
ING040101	Black Beauty Coal, Dinken Cr M	Minor	Montgomery	Daviess	Active
ING040102	Triad Mining, Switz City Mine	Minor	Lyons	Greene	Active
ING040112	Black Beauty Coal, Pit #4 Mine	Minor	Montgomery	Daviess	Inactive
ING040117	United Minerals, Pit #10 Mine	Minor	Montgomery	Daviess	Inactive
ING040134	Solar Sources, Monroe City Min	Minor	Vincennes	Knox	Active
ING040138	Solar Sources, AML Site #293	Minor	Bicknell	Knox	Inactive
ING040143	Solar Sources, Craney Mine	Minor	Cannelburg	Daviess	Active
ING040145	BB Mining Inc., Pride Mine	Minor	Monroe City	Knox	Active
ING040148	Coal Inc., 4th Vein Mine	Minor	Linton	Greene	Active
ING040149	Nancy Coal, AML Site 1069	Minor	Washington	Daviess	Inactive
ING040156	Black Beauty, Odon Rail #1	Minor	Odon	Daviess	Inactive
ING040157	Black Beauty, Odon Rail Siding	Minor	Odon	Daviess	Active
ING040162	Black Beauty, Viking Mine	Minor	Montgomery	Daviess	Active
ING040163	AML Site #870, Carr & Thomas	Minor	Edwardsport	Knox	Active
ING490037	Michael & Sons, Inc.	Minor	Bloomfield	Greene	Active

Table 3-2 (Continued)

NPDES	Facility Name	Maj / Mi	City	County	Status
ING490063	White River Quarry, the	Minor	Camby	Marion	Active
ING670006	Tenneco Energy/Midwestern Gas	Minor	Wheatland	Knox	Inactive
INP000063	Sunbeam Outdoor Products	Minor	Linton	Greene	Inactive
INP000159	Butterfield Foods, Div. -Marsh	Minor	Pennville	Jay	Active
INP000176	Perdue Farms, Inc.	Minor	Washington	Daviess	Active
INP000200	Scepter Industries, Inc.	Minor	Bicknell	Knox	Active
IN0001082	Griffin Industries, Inc.	Minor	Newberry	Greene	Active
IN0001180	CSX Transportation, Inc.	Minor		Daviess	Inactive
IN0001945	Rostone Corporation	Minor		Owen	Inactive
IN0002780	PSI Edwardsport Gen. Station	Major	Edwardsport	Knox	Active
IN0002887	IPL, Petersburg Gen. Station	Major	Petersburg	Pike	Active
IN0002968	Peabody Coal, Latta Mine	Minor		Greene	Inactive
IN0003611	Elnora Water Plant	Minor		Daviess	Active
IN0004006	Michael & Son Stone Service	Minor	Bloomfield	Greene	Inactive
IN0004065	Davis Dairy Farms Inc	Minor		Brown	Inactive
IN0004391	Hoosier Energy Rec, Inc.	Major	Petersburg	Pike	Active
IN0004791	Switz City Water Plant	Minor		Greene	Inactive
IN0005053	Bicknell Water Works	Minor	Bicknell	Knox	Inactive
IN0020192	Spencer Municipal STP	Minor	Spencer	Owen	Active
IN0020214	Odon Municipal STP	Minor	Odon	Daviess	Active
IN0020575	Linton Municipal STP	Minor	Linton	Greene	Active
IN0021083	Ellettsville Municipal STP	Minor	Ellettsville	Monroe	Active
IN0021555	Usdn Usn Crn Nvl Ammo Dpt STP	Minor		Martin	Inactive
IN0022373	Bloomfield Municipal STP	Minor	Bloomfield	Greene	Active
IN0023639	Lyons Municipal STP	Minor	Lyons	Greene	Active
IN0023795	Monroe City Municipal STP	Minor	Monroe City	Knox	Active
IN0024325	Petersburg Municipal STP	Minor	Petersburg	Pike	Active
IN0025658	Washington Municipal STP	Major	Washington	Daviess	Active
IN0030856	North Daviess Jr-Sr High Sch.	Minor	Elnora	Daviess	Active
IN0031003	General Electric Co., Linton	Minor	Linton	Greene	Active
IN0031470	Eastern Dist El Jr Sr H.S.	Minor	Bloomfield	Greene	Active
IN0033014	Washington Public Water Supply	Minor	Washington	Daviess	Inactive
IN0034568	Armour Food Co-Washington	Minor		Daviess	Inactive
IN0035726	Bloomington N (Blucher Poole)	Major	Bloomington	Monroe	Active
IN0036170	Griffy Water Treatment Plant	Minor	Bloomington	Monroe	Inactive
IN0036358	Timber Ridge Camp	Minor		Owen	Inactive
IN0036722	Peabody Coal Co-no2 Lattamine	Minor		Greene	Inactive
IN0036790	South Knox Jr-Sr High School	Minor	Vincennes	Knox	Active
IN0037443	L&M School	Minor		Greene	Inactive
IN0037605	Star of Indiana	Minor	Bloomington	Monroe	Active
IN0037621	National Mobile Homes	Minor		Knox	Inactive
IN0038296	Plainville Municipal STP	Minor	Plainville	Daviess	Active
IN0038415	Oakwood Mobile Home Park	Minor	Washington	Daviess	Active
IN0038466	Timber Ridge Camp	Minor	Spencer	Owen	Active
IN0039110	Luthern Hills Camp	Minor	Morgantown	Brown	Active
IN0039276	Bicknell Municipal STP	Minor	Bicknell	Knox	Active

Table 3-2 (Continued)

NPDES	Facility Name	Maj / Mi	City	County	Status
IN0039811	Cannelburg Municipal STP	Minor		Daviess	Inactive
IN0039977	Edwardsport Municipal STP	Minor		Knox	Inactive
IN0039985	Elnora Municipal STP	Minor	Elnora	Daviess	Active
IN0040088	Gosport Municipal STP	Minor	Gosport	Owen	Active
IN0040584	Sandborn Municipal STP	Minor		Knox	Inactive
IN0040801	Worthington Municipal STP	Minor	Worthington	Greene	Active
IN0040819	Decker Municipal STP	Minor		Knox	Inactive
IN0041009	Unionville Elementary School	Minor	Unionville	Monroe	Active
IN0041432	Wheatland Wtr Trmt Plt	Minor	Wheatland	Knox	Inactive
IN0041505	Montgomery Public Water Supply	Minor	Montgomery	Daviess	Inactive
IN0041688	New Berry Municipal STP	Minor		Greene	Inactive
IN0041793	Rex Alton Co.	Minor		Daviess	Inactive
IN0041823	Hazeldon Town of Wtp	Minor		Gibson	Inactive
IN0042650	Switz City Town of	Minor	Switz City	Greene	Active
IN0043079	Wheatland Municipal STP	Minor		Knox	Inactive
IN0043737	Odon Public Water Supply	Minor	Odon	Daviess	Active
IN0043753	Lyons Water Utility	Minor	Lyons	Greene	Active
IN0044971	Brown County Water Utility	Minor	Morgantown	Morgan	Active
IN0045071	Indiana University	Minor	Bloomington	Monroe	Active
IN0045519	Old Ben Coal Company	Minor		Pike	Inactive
IN0045918	Neals Landfill Sprg Wtr Trtmnt	Major	Bloomington	Monroe	Active
IN0046132	J H & L Coal Co, Bridwell Mine	Minor	Worthington	Greene	Inactive
IN0046167	Black Joule Resources, Inc.	Minor		Daviess	Inactive
IN0046221	Black Beauty Coal, Prairie Crk	Minor	Cannelburg	Daviess	Inactive
IN0046329	United Minerals, Wagler Raber	Minor		Daviess	Inactive
IN0046388	Bicknell Minerals, Slurry Pond	Minor	Bicknell	Knox	Inactive
IN0046400	Solar Sources, Carbondale Prep	Minor	Petersburg	Pike	Inactive
IN0046451	Green Const., Superior #4 Pit	Minor	Cannelburg	Daviess	Inactive
IN0046485	Fossil Fuels, Castle Knoll M.	Minor	Switz City	Greene	Inactive
IN0046540	Central Disposal, Inc.	Minor	Switz City	Greene	Inactive
IN0046558	B&Ls Contracting, Switz City R	Minor	Switz City	Greene	Inactive
IN0046582	Marigold Mining, Dinken Ck Pit	Minor	Montgomery	Daviess	Inactive
IN0046591	Central Utility Coal Co., Inc.	Minor	Cannelburg	Daviess	Inactive
IN0046621	Black Beauty Coal, Miller Crk	Minor	Switz City	Greene	Inactive
IN0046655	Rogers Group, Mine #3	Minor	Loogootee	Martin	Inactive
IN0046728	Green Const., Craney Mine	Minor	Cannelburg	Daviess	Inactive
IN0046850	Feather River Coal Co.	Minor		Greene	Inactive
IN0046884	Spencer Coal, Alford Field	Minor		Pike	Inactive
IN0047015	Rogers Group, Mine #1	Minor	Cannelburg	Daviess	Inactive
IN0047023	Coal, Inc.	Minor	Linton	Greene	Inactive
IN0047236	Fowler Excavating, Bullock Min	Minor	Montgomery	Daviess	Active
IN0047279	Monroe Cnty Sanitary Landfill	Major	Bloomington	Monroe	Inactive
IN0047317	Cherokee Minerals, Inc.	Minor	Bicknell	Knox	Inactive
IN0047341	Spencer Coal, Osmon Pit	Minor		Knox	Inactive
IN0047350	Rogers Group, Owl Prairie Coal	Minor	Elnora	Daviess	Inactive

Table 3-2 (Continued)

NPDES	Facility Name	Maj/Mi	City	County	Status
IN0047384	Southwind Mining, Wheatland Mi	Minor	Wheatland	Knox	Inactive
IN0047520	Black Beauty Coal, Cat Spring	Minor	Switz City	Greene	Inactive
IN0047708	Green Const., Lengacher Mine	Minor	Epsom	Daviess	Inactive
IN0047724	Delta Mining Corp, Prairie Cr	Minor		Daviess	Inactive
IN0047732	Delta Mining Corp, Sand Hill M	Minor		Daviess	Inactive
IN0047741	Great Lakes Coal Co, Linton #1	Minor		Greene	Inactive
IN0047759	Great Lakes Coal Co, Linton #2	Minor		Greene	Inactive
IN0047783	Shaw Contractors/r & R Coal	Minor	Loogootee	Martin	Inactive
IN0047988	Solar Sources, Prides Ck Mine	Minor		Pike	Inactive
IN0048038	Black Beauty Coal, Viking Mine	Minor	Montgomery	Daviess	Inactive
IN0048046	M & T Coal Co, Stickles #1 Pit	Minor		Daviess	Inactive
IN0048071	Sidco, Inc. County Pit #1	Minor	Freelandville	Knox	Inactive
IN0048160	R & H Mining, Inc.	Minor	Petersburg	Pike	Inactive
IN0048178	Black Beauty Coal, Apraw #4 Mi	Minor	Wheatland	Knox	Inactive
IN0048186	Black Beauty Coal Co.	Minor	Switz City	Greene	Inactive
IN0048194	Solar Sources, Inc. - Pit 17	Minor		Pike	Inactive
IN0048208	Black Beauty Coal, Arlen #1 Mi	Minor	Plainville	Daviess	Inactive
IN0048330	Phoenix Nr, Odon Rail Siding	Minor	Odon	Daviess	Inactive
IN0048526	Fossil Fuels, Castle Hill Mine	Minor	Switz City	Greene	Inactive
IN0048585	Miller Mining, Dukes Pit	Minor	Switz City	Greene	Inactive
IN0048691	Davco East Dock Corporation	Minor	Odon	Daviess	Inactive
IN0048721	Great Lakes Coal Co, Linton #3	Minor		Greene	Inactive
IN0048780	Phoenix Nr, Odon II Railsiding	Minor	Odon	Daviess	Inactive
IN0049115	Allied Minerals, J & R Undergr	Minor	Bicknell	Knox	Inactive
IN0049221	Solar Sources, Inc. - Pit 16	Minor		Pike	Inactive
IN0049328	Solar Sources, Inc. - Pit 10	Minor		Pike	Inactive
IN0049492	Miller Mining, Gregg Pit	Minor		Greene	Inactive
IN0049531	Delta Mining Corp, Knepp #1 M.	Minor		Daviess	Inactive
IN0049590	Dyer Enterprises, Knepp Pit M.	Minor		Daviess	Inactive
IN0049611	Foertsch Const, Little Sandy 2	Minor	Cannelburg	Daviess	Inactive
IN0049891	Helmsburg Elementary School	Minor	Nashville	Brown	Active
IN0050105	Monroe County Regional Sewer D	Minor	Stinesville	Monroe	Active
IN0050270	Old Ben Coal Co, No. 2 Mine	Minor		Pike	Inactive
IN0050466	Foertsch Const, Little Sandy 1	Minor	Cannelburg	Daviess	Inactive
IN0050547	Green Const., Grabber Mine	Minor	Cannelburg	Daviess	Inactive
IN0050571	Calox, Inc.	Minor		Monroe	Inactive
IN0051403	Ohio Valley Company - Npr	Minor		Knox	Inactive
IN0052281	Essex Group, Inc.	Minor		Pike	Inactive
IN0052434	Gosport, Town of	Minor		Owen	Inactive
IN0052809	Solar Sources, Inc.	Minor		Knox	Inactive
IN0052876	Mifflin Mining Co Inc	Minor		Daviess	Inactive
IN0053309	Florida Material Producers Inc	Minor		Daviess	Inactive
IN0053384	ABB Power T & D Company, Inc.	Major	Bloomington	Monroe	Active
IN0053635	Woodland Bible Camp, Inc.	Minor	Dugger	Greene	Inactive
IN0053660	Cannelburg Coal Corp.	Minor	Cannelburg	Daviess	Inactive

Table 3-2 (Continued)

NPDES	Facility Name	Maj / Mi	City	County	Status
IN0054020	Northern Coal, Flynn Mine	Minor	Linton	Greene	Active
IN0053899	Camp Gallahue	Minor	Morgantown	Brown	Active
IN0054216	United Minerals, Scottland Min	Minor	Owensburg	Greene	Inactive
IN0054275	United Minerals, Umi Pit #4	Minor	Montgomery	Daviess	Inactive
IN0054291	Fossil Fuels Resources, Inc.	Minor	Bicknell	Knox	Inactive
IN0054321	Foertsch Constr Little Sandy 4	Minor	Lamar	Daviess	Inactive
IN0054411	Northern Coal, Scaffold Prairi	Minor	Worthington	Greene	Active
IN0054739	United Minerals, UMI Pit #5	Minor	Montgomery	Daviess	Inactive
IN0054780	Beech Coal Co., Sycamore Mine	Minor	Bicknell	Knox	Inactive
IN0055301	Black Beauty Coal, Black Crk M	Minor	Linton	Greene	Inactive
IN0055328	Northern Coal, Midland Mine	Minor	Midland	Greene	Active
IN0055387	Black Beauty Coal, Air Qual #2	Minor	Evansville	Knox	Inactive
IN0055395	Foertsch Construction Co., Inc	Minor	Odon	Daviess	Inactive
IN0055433	Black Beauty Coal, Air Qual #1	Minor	Evansville	Knox	Inactive
IN0055590	Solar Sources, Bowman Mine	Minor	Petersburg	Pike	Inactive
IN0055603	Triad Mining, Switz City Mine	Minor	Switz City	Greene	Inactive
IN0055671	Foertsch Construction Company	Minor	Odon	Daviess	Inactive
IN0055735	United Minerals, UMI Mine #10	Minor	Montgomery	Daviess	Inactive
IN0055875	United Minerals, Lyons Pit	Minor	Huntingburg	Greene	Inactive
IN0055930	Solar Sources, Sugar Creek Min	Minor	Cannelburg	Daviess	Inactive
IN0056081	IDNR Sidco Knox No. 1 Mine	Minor	Freelandville	Knox	Inactive
IN0056111	Wallace Enterprises, Odon Rail	Minor	Odon	Daviess	Inactive
IN0056201	Black Beauty Coal, Thompson Cr	Minor	Montgomery	Daviess	Inactive
IN0056316	Northern Coal, Britton Mine	Minor	Worthington	Greene	Active
IN0056588	Solar Sources, Monroe City Min	Minor	Petersburg	Knox	Inactive
IN0056642	Foertsch Const, Little Sandy 7	Minor	Mongomery	Daviess	Inactive
IN0056723	Black Diamond Coal Co. Inc.	Minor	Linton	Greene	Inactive
IN0056961	Indiana Mining Inc., Pit #1	Minor	Dugger	Sullivan	Inactive
IN0057070	IDNR Site 1042, Prairie Crk 4	Minor	Raglesville	Daviess	Inactive
IN0057291	IDNR Site 273, Burke Tipple Mn	Minor		Greene	Inactive
IN0057461	Fowler Excavating, Mine #5	Minor	Bramble	Daviess	Active
IN0057509	IDNR Site 292, American #2 Aml	Minor	Bicknell	Knox	Inactive
IN0057550	Solar Sources, Cannelburg Mine	Minor	Cannelburg	Daviess	Inactive
IN0057584	Northern Coal-Owen Mine	Minor		Greene	Inactive
IN0058416	Helmsburg Regional Sewer Dist.	Minor	Helmsburg	Brown	Active
IN0058742	Solar Sources, Wheatland Rail	Minor	Wheatland	Knox	Active
IN0059641	Grain Processing Corp. 2nd Plt	Minor	Washington	Daviess	Active
IN0059935	Bloomington North High School	Minor	Bloomington	Monroe	Active
IN0060143	Hazelton Water Department	Minor	Hazleton	Gibson	Active
IN0109622	Wood Stone Company	Minor		Monroe	Inactive

3.3 Nonpoint Sources of Pollution

Nonpoint source pollution refers to runoff that enters surface waters through stormwater runoff, contaminated ground water, snowmelt or atmospheric deposition. There are many types of land use activities that can serve as sources of nonpoint source pollution including land development, construction, mining operations, crop production, animal feeding lots, timber harvesting, failing septic systems, landfills, roads and paved areas. Stormwater from large urban areas (greater than100,000 people) and from certain industrial and construction sites is technically considered a point source since NPDES permits are required for discharges of stormwater from these areas.

Sediment and nutrients are major pollution causing substances associated with nonpoint source pollution. Others include *E. coli* bacteria, heavy metals, pesticides, oil and grease, and any other substance that may be washed off the ground or removed from the atmosphere and carried into surface waters. Unlike point source pollution, nonpoint pollution sources are diffuse in nature and occur at random time intervals depending on rainfall events. Below is a brief description of major areas of nonpoint sources of pollution in the Lower White River watershed.

3.3.1 Agriculture

There are a number of activities associated with agriculture that can serve as potential sources of water pollution. Land clearing and tilling make soils susceptible to erosion, which can then cause stream sedimentation. Pesticides and fertilizers (including synthetic fertilizers and animal wastes) can be washed from fields or improperly designed storage or disposal sites. Construction of drainage ditches on poorly drained soils enhances the movement of oxygen consuming wastes, sediment and soluble nutrients into groundwater and surface waters.

Concentrated animal operations can be a significant source of nutrients, biochemical oxygen demand and *E. coli* bacteria if wastes are not properly managed. Impacts can result from over application of wastes to fields, from leaking lagoons and from flows of lagoon liquids to surface waters due to improper waste lagoon management. Also there are potential concerns associated with nitrate-nitrogen movement through the soil from poorly constructed lagoons and from wastes applied to the soil surface.

Grassed waterways, conservation tillage, and no-till practices are several common practices used by many farmers to minimize soil loss. Maintaining a vegetated buffer between fields and streams is another excellent way to minimize sediment and nutrient loads to streams.

3.3.2 Urban/Residential

Runoff from urbanized areas, as a rule, is more localized and can often be more severe in magnitude than agricultural runoff. Any type of land-disturbing activity such as land clearing or excavation can result in soil loss and sedimentation. The rate and volume of runoff in urban areas is much greater due both to the high concentration of impervious surface areas and to storm drainage systems that rapidly transport stormwater to nearby surface waters. This increase in volume and rate of runoff can result in streambank erosion and sedimentation in surface waters.

Urban drainage systems, including curb and guttered roadways, also allow urban pollutants to reach surface waters quickly and with little or no filtering. Pollutants include lawn care pesticides and fertilizers; automobile fluids; lawn and household wastes; road salts, and E. coli bacteria (from animals and failing septic systems). The diversity of these pollutants makes it very challenging to attribute water quality degradation to any one pollutant.

Replacement of natural vegetation with pavement and removal of buffers reduces the ability of the watershed to filter pollutants before they enter surface waters. The chronic introduction of these pollutants and increased flow and velocity into a stream results in degraded waters. Many waters adjacent to urban areas are rated as biologically poor. This degradation also exists in lakes, which have been heavily influenced by adjacent urban development.

The population figures discussed in Section 2.3.2 are good indicators of where urban development and potential urban water quality impacts are likely to occur. Concentrated areas where urban development is high may lead to further water quality problems associated with the addition of impervious surfaces next to surface waters.

3.3.3 Onsite Wastewater Disposal

Septic systems contain all of the wastewater from a household or business. A complete septic system consists of a septic tank and an absorption field to receive effluent from the septic tank. The septic tank removes some wastes, but the soil absorption field provides further absorption and treatment. Septic systems can be a safe and effective method for treating wastewater if they are sized, sited, and maintained properly. However, if the tank or absorption field malfunction or are improperly placed, constructed or maintained, nearby wells and surface waters may become contaminated.

Some of the potential problems from malfunctioning septic systems include:

- Polluted groundwater: Pollutants in septic effluent include bacteria, nutrients, toxic substances, and oxygen-consuming wastes. Nearby wells can become contaminated by failing septic systems.

- Polluted surface water: Groundwater often carries the pollutants mentioned above into surface waters, where they can cause serious harm to aquatic ecosystems. Leaking septic tanks can also leak into surface waters through or over the soil. In addition, some septic tanks may directly discharge to surface waters.

- Risks to human health: Septic system malfunctions can endanger human health when they contaminate nearby wells, drinking water supplies, and fishing and swimming areas.

Pollutants associated with onsite wastewater disposal may also be discharged directly to surface waters through direct pipe connections between the septic system and surface waters (straight pipe discharge). However, 327 IAC 5-1-1.5 specifically states that “point source discharge of sewage treated or untreated, from a dwelling or its associated residential sewage disposal system, to the waters of the state is prohibited”.

3.3.4 Construction

Construction activities that involve excavation, grading or filling can produce significant sedimentation if not properly controlled. Sedimentation from developing urban areas can be a major source of pollution due to the cumulative number of acres disturbed in a watershed. Construction of single family homes in rural areas can also be a source of sedimentation when homes are placed in or near stream corridors.

As a pollution source, construction activities are typically temporary, but the impacts on water quality can be severe and long lasting. Construction activities tend to be concentrated in the more rapidly developing areas of the watershed.

4. Water Quality and Use Support Ratings in the Lower White River Watershed

This section provides a detailed overview of water quality monitoring, water quality, and use support ratings in the Lower White River watershed and includes the following:

Section 4.1	Water Quality Monitoring Programs
Section 4.2	Summary of Ambient Monitoring Data for the Lower White River Watershed
Section 4.3	Fish Consumption Advisories
Section 4.4	Clean Water Act Section 305(b) Report
Section 4.5	Clean Water Act Section 305(b) Assessment and Use-Support: Methodology

4.1 Water Quality Monitoring Programs

This section discusses water quality monitoring programs. Specifically, Section 4.1.1 describes IDEM's Office of Water Quality monitoring programs and Section 4.1.2 discusses other monitoring efforts in the watershed.

4.1.1 Office of Water Quality Programs

The Water Quality Assessment Branch of the Office of Water Quality is responsible for assessing the quality of water in Indiana's lakes, rivers and streams. This assessment is performed by field staff from the Survey Section and the Biological Studies Section. Virtually every element of IDEM's surface water quality management program of IDEM is directly or indirectly related to activities currently carried out by this Branch. The biological and surface water monitoring activities identify stream reaches, watersheds or segments where physical, chemical and/or biological quality has been or would be impaired by either point or nonpoint sources. This information is used to help allocate waste loads equitably among various sources in a way that would ensure that water quality standards are met along stream reaches in each of the nearly 100 stream segments in Indiana.

The purpose of the Surveys Section is to provide the water quality and hydrological data required for the assessment of Indiana's waters by conducting Watershed/Basin Surveys and Stream Reach Surveys. In 1996, the Section began a five-year synoptic study (Basin Monitoring Strategy) of the State's ten major watersheds. Information from these studies will be integrated with data from biological and nonpoint source studies as well as the Fixed Station Monitoring Program to make a major assessment of the State's waters. Such surveys determine the extent to which water quality standards are being met and whether the fishable, swimmable and water supply uses are being maintained.

Information derived from this strategy will contribute significantly to improved planning processes throughout the Office of Water Quality. This plan should initiate the development of interrelated action plans, which encompass the wide range of responsibilities, such as rule making, permitting, compliance, nonpoint source issues, and wastewater treatment facility oversight.

The Biological Studies Section conducts studies of fish and macroinvertebrate communities as well as stream habitats to establish biological conditions to which other streams may be compared in order to identify impaired streams or watersheds. The Biological Studies Section also conducts fish tissue and sediment sampling to pinpoint sources of toxic and bioconcentrating substances. Fish tissue data serve as the basis for fish consumption advisories, which are issued, through the Indiana State Department of Health, to protect the health of Indiana citizens. This Section also participates in the development of site-specific water quality standards.

The Biological Studies Section relies on the Volunteer Water Quality Monitoring Programs to provide additional data on lakes and wetlands that may not be sampling sites in the Monitoring Strategy. Volunteer collected data provides IDEM scientists with an overall view of water quality trends and early warning of problems that may be occurring in a lake or wetland. If volunteers detect that a lake or wetland is severely degraded, professional IDEM scientists will conduct follow up investigation.

4.2 Summary of Ambient Monitoring Data for the Lower White River Watershed

The fixed station-monitoring program managed by IDEM's Office of Water Quality has been monitoring surface water chemistry throughout the state since 1957. The data set from 1986 to 1995 was analyzed using the Seasonal Kendall test. This test deduces if a statistical change in the surface water chemistry occurred over a time period. The results of the Seasonal Kendall analysis for stations located in the Lower White River watershed are provided in Table 4-1. The data collected from 1991 to 1997 from this monitoring program was also analyzed to determine benchmark characteristics. The results of the benchmark characteristic analysis for stations located in the Lower White River watershed are provided in Appendix B. For a more in depth discussion of this analysis, please refer to the Indiana Fixed Station Statistical Analysis 1997 (IDEM 32/02/005/1998), published in May 1998 by the Assessment Branch of the Office of Water Quality - IDEM.

TABLE 4-1
RESULTS OF SEASONAL KENDALL ANALYSIS FOR STATIONS LOCATED IN THE LOWER WHITE RIVER WATERSHED 1986 TO 1995

Parameter	WR-19 Old U.S. 41 bridge, Hazelton	WR-46 State Highway 61 bridge, Petersburg	WR-81 SR 358 bridge, below power station, Edwardsport	WR-162 Main street bridge, Spencer
Biological Oxygen Demand	↔	➘	↔	↔
Chemical Oxygen Demand	↔	↔	➘	↔
Dissolved Oxygen	↔	➚	➚	↔
E. coli	↔	↔	↔	➘
Ammonia	↔	↔	↔	↔
Nitrite + Nitrate	↔	↓	↓	↓
Total phosphorus	↔	➘	↓	↓
Total Residue	↔	↔	↓	➘
Total Residue, Filterable	?	?	?	?
Total Residue, Nonfilterable	↔	➘	➘	➘
Copper	?	↓	?	?
Cyanide (total)	?	↔	?	↔

Notes

↔ No Statistical Change; significance < 80% or reported slope = 0.00000

↓ Statistically Decreasing; significance >95% with a negative slope

➘ Potentially Decreasing; significance >80% with a negative slope

➚ Potentially Increasing; significance >80% with a positive slope

↑ Statistically Increasing; significance >95 % with a positive slope

? Insufficient Data for analysis

4.3 Fish Consumption Advisories

Since 1972, the Indiana Department of Natural Resources, the IDEM, and the Indiana State Department of Health (ISDH) have worked together to create the Indiana Fish Consumption Advisory. Each year members from these three agencies meet to discuss the findings of recent fish monitoring data and to develop the new statewide fish consumption advisory.

The 1998 advisory is based on levels of PCBs and mercury found in fish tissue. Fish are tested regularly only in areas where there is suspected contamination. In each area, samples were taken of bottom-feeding fish, top-feeding fish, and fish feeding in between. Over 1,600 fish tissue samples collected throughout the state were analyzed for PCBs, pesticides, and heavy metals. Of those samples, 99 percent contained mercury. Criteria for placing fish on the 1996 Indiana Fish Consumption Advisory have changed from using the Food and Drug Administration guidelines to using the Great Lakes Task Force risk-based approach.

The ISDH defines the Advisory Groups as follows:

Group 1	Unrestricted consumption
Group 2	One meal per week (52 meals per year) for adult males and females. One meal per month for women who are pregnant or breastfeeding, women who plan to have children, and children under the age of 15.
Group 3	One meal per month (12 meals per year) for adult males and females. Women who are pregnant or breastfeeding, women who plan to have children, and children under the age of 15 do not eat.
Group 4	One meal every two months (six meals per year) for adult males and females. Women who are pregnant or breastfeeding, women who plan to have children, and children under the age of 15 do not eat.
Group 5	No consumption (DO NOT EAT)

Carp generally are contaminated with both PCBs and mercury. Except as otherwise noted, carp in all Indiana rivers and streams fall under the following risk groups:

Carp, 15-20 inches - Group 3
Carp, 20-25 inches - Group 4
Carp over 25 inches - Group 5

In the Lower White River Watershed, the following waterbodies are under the 1999 fish consumption advisory:

1999 Fish Consumption Advisory

Waterbody/County	Species	Size	Contaminant	Group
Richland Creek/Monroe County	Creek Chub	6-7	PCB	3
		7+	PCB	4
	Rock Bass	4-8	Mercury, PCB	2
		8+	Mercury, PCB	3
	White Sucker	8-11	Mercury, PCB	3
		11+	Mercury, PCB	4
Richland Creek/Owen County	Creek Chub	5-9	Mercury, PCB	3
		9+	Mercury, PCB	4
	Longear Sunfish	4-6	Mercury, PCB	2
		6+	Mercury, PCB	3
	Rock Bass	6-7	Mercury, PCB	2
		7+	Mercury, PCB	3
Stouts Creek/Monroe County	Creek Chubs	4-8	Mercury, PCB	2
		8+	Mercury, PCB	3
West Fork of the White River/ Owen County	Bigmouth Buffalo	16-24	Mercury, PCB	2
		24+	Mercury, PCB	3
	Carpsucker	13-18	PCB	3
		18+	PCB	4
	Channel Catfish	14-16	PCB	3
		16+	PCB	4
	Spotted Sucker	11-13	PCB	3
		13+	PCB	4
	White Bass	14-15	Mercury, PCB	3
		15+	Mercury, PCB	4
West Fork of the White River/ Greene County	Bigmouth Buffalo	Up to 20	PCB	2
		20+	PCB	3
	Carpsucker	13-18	PCB	2
		18+	PCB	3
	Channel Catfish	14-16	PCB	3
		16+	PCB	4
	Spotted Sucker	11-13	PCB	3
		13+	PCB	4
West Fork of the White River/ Daviess County	Bigmouth Buffalo	17-19	Mercury, PCB	2
	Carpsucker	13-18	PCB	3
		18+	PCB	4
	Channel Catfish	14-16	PCB	3
		16+	PCB	4
	Flathead Catfish	11-14	Mercury, PCB	2
		14+	Mercury, PCB	3
	Spotted Sucker	11-13	PCB	3
		13+	PCB	4
	White Bass	11-14	Mercury, PCB	3
		14+	Mercury, PCB	4
West Fork of the White River/ Pike County	Bigmouth Buffalo	21-25	Mercury, PCB	2
		25+	Mercury, PCB	3
	Carpsucker	13-18	PCB	3
		18+	PCB	4
	Channel Catfish	14-17	PCB	3
		17+	PCB	4
	Flathead Catfish	9-16	PCB	2
		16+	PCB	3
	Freshwater Drum	12-14	Mercury, PCB	2
		14+	Mercury, PCB	3
	Quillback	14-15	Mercury	3

1999 Fish Consumption Advisory

Waterbody/County	Species	Size	Contaminant	Group
		15+	Mercury	4
	River Carpsucker	15-17	PCB	3
		17+	PCB	4
	Smallmouth Bass	7-12	Mercury	2
		12+	Mercury	3
	Spotted Bass	9+	PCB	3
	Spotted Sucker	11-13	PCB	3
		13+	PCB	4
West Fork of the White River/ Gibson County	Carpsucker	6-18	Mercury, PCB	3
		18+	Mercury, PCB	4
	Channel Catfish	14-17	PCB	3
		17+	PCB	4
	Freshwater Drum	12-14	PCB	2
		14+	PCB	3
	Largemouth Bass	11-17	Mercury	2
		17+	Mercury	3
	Quillback	Up to 11	PCB	2
		11+	PCB	3
	River Carpsucker	16-18	Mercury, PCB	3
		18+	Mercury, PCB	4
	Spotted Sucker	11-13	PCB	3
		13+	PCB	4
Griffy Lake/Monroe County	Bluegill	7+	Mercury	2
	Largemouth Bass	10-11	Mercury	2
		11+	Mercury	3
Lake Lemon/Monroe County	Flathead Catfish	10-20	PCB	2
		20+	PCB	3
	Largemouth Bass	10-15	Mercury	2
		15+	Mercury	3

4.4 Clean Water Act Section 305(b) Report

Section 305(b) of the Clean Water Act requires states to prepare and submit to the EPA a water quality assessment report of state water resources. A new surface water monitoring strategy for the Office of Water Quality was implemented in 1996 with the goal of monitoring all waters of the state by 2001 and reporting the assessments by 2003. Each year approximately 20 percent of the waterbodies in the state will be assessed and reported the following year. The methodology of the Clean Water Act Section 305(b) assessment and use support ratings are discussed in Section 4.5.

The Lower White River assessment was updated during the summer of 1996 as part of the five year, rotating basin, monitoring strategy. The results of the 1996 assessment are reported in the 1998 305(b) report, titled *Indiana Water Quality Report 1998* (IDEM, 1998). The 1998 305(b) report is the most current and comprehensive assessment of the Lower White River watershed.

Appendix B contains the listing of the Lower White River watershed waterbodies assessed, status of designated use support, probable causes of impairment, and stream miles affected. This assessment was based on data collected during the summer of 1996. From examination of

Appendix B, it is readily apparent that the majority of water quality impairments are due to pathogens, PCBs, mercury, and metals.

4.5 Clean Water Act Section 305(b) Assessment and Use-Support: Methodology

The Office of Water Quality determines use support status for each stream and waterbody in accordance with the assessment guidelines provided by EPA (1997). Results from four monitoring programs are integrated to provide an assessment for each stream and waterbody:

Physical/chemical water column results,
Benthic aquatic macroinvertebrate community assessments,
Fish tissue and surficial aquatic sediment contaminant results, and
E. coli monitoring results.

The assessment process was applied to each data sampling program. The individual assessments were integrated into an overall assessment for each waterbody by use designation: aquatic life support, fish consumption, and recreational use. River miles in a watershed appear as one waterbody while each lake in a watershed is reported as a separate waterbody.

Physical/chemical data for toxicants (total recoverable metals), conventional water chemistry parameters (dissolved oxygen, pH, and temperature), and bacteria (*E. coli*) were evaluated for exceedance of the Indiana Water Quality Standards (327 IAC 2-1-6). U.S. EPA 305(b) Guidelines were applied to sample results as indicated in Table 4-3 (U.S. EPA 1997b).

TABLE 4-2
CRITERIA FOR USE SUPPORT ASSESSMENT*

Parameter	Fully Supporting	Partially Supporting	Not Supporting
Aquatic Life Use Support			
Toxicants	Metals were evaluated on a site by site basis and judged according to magnitude of exceedance and the number of times exceedances occurred.		
Conventional inorganics	There were very few water quality violations, almost all of which were due to natural conditions.		
Benthic aquatic macroinvertebrate Index of Biotic Integrity (mIBI)	mIBI $\geq$ 4.	mIBI < 4 and $\geq$ 2.	mIBI < 2.
Qualitative habitat use evaluation (QHEI)	QHEI $\geq$ 64.	QHEI < 64 and $\geq$ 51.	QHEI < 51.
Fish community (fIBI) (Lower White River only)	IBI $\geq$ 44.	IBI < 44 and $\geq$ 22	IBI < 22.
Sediment (PAHs = polynuclear aromatic hydrocarbons. AVS/SEM = acid volatile sulfide/ simultaneously extracted metals.)	All PAHs $\leq$ 75th percentile. All AVS/SEMs $\leq$ 75th percentile. All other parameters $\leq$ 95th percentile.	PAHs or AVS/SEMs > 75th percentile. (Includes Grand Calumet River and Indiana Harbor Canal sediment results, and so is a conservative number.)	Parameters > 95thpercentile as derived from IDEM Sediment Contaminants Database.
Indiana Trophic State Index (lakes only)	Nutrients, dissolved oxygen, turbidity, algal growth, and sometimes pH were evaluated on a lake-by-lake basis. Each parameter judged according to magnitude.		
Fish Consumption			
Fish tissue	No specific Advisory*	Limited Group 2 - 4 Advisory*	Group 5 Advisory*
* Indiana Fish Consumption Advisory, 1997, includes a state wide advisory for carp consumption. This was not included in individual waterbody reports because it obscures the magnitude of impairment caused by other parameters.			
Recreational Use Support (Swimmable)			
Bacteria (cfu = colony forming units.)	No more than one grab sample slightly > 235 cfu/100ml, and geometric mean not exceeded.	No samples in this classification.	One or more grab sample exceeded 235 cfu/100ml, and geometric mean exceeded.

*From Indiana Water Quality Report for 1998

5 State and Federal Water Programs

This Chapter summarizes the existing point and nonpoint source pollution control programs available for addressing water quality problems in the Lower White River watershed. Chapter 5 includes:

Section 5.1 Indiana Department of Environmental Management Water Quality Programs
Section 5.2 Indiana Department of Natural Resources Water Programs
Section 5.3 USDA/Natural Resources Conservation Service Water Programs

5.1 Indiana Department of Environmental Management Water Quality Programs

This Section describes the water quality programs managed by the Office of Water Quality within IDEM and includes:

Section 5.1.1 State and Federal Legislative Authorities for Indiana's Water Quality Program
Section 5.1.2 Indiana's Point Source Control Program
Section 5.1.3 Indiana's Nonpoint Source Control Programs
Section 5.1.4 Integrating Point and Nonpoint Source Pollution Control Strategies
Section 5.1.5 Potential Sources of Funding for Water Quality Projects

5.1.1 State and Federal Legislative Authorities for Indiana's Water Quality Program

Authorities for some of the programs and responsibilities carried out by the Office of Water Quality are derived from a number of federal and state legislative mandates outlined below. The major federal authorities for the state's water quality program are found in sections of the Clean Water Act. State authorities are from state statutes.

<u>Federal Authorities for Indiana's Water Quality Program</u>

- The Clean Water Act Section 301 - Prohibits the discharge of pollutants into surface waters unless permitted by EPA.
- The Clean Water Act Section 303(c) - States are responsible for reviewing, establishing and revising water quality standards for all surface waters.
- The Clean Water Act Section 303(d) - Each state shall identify waters within its boundaries for which the effluent limits required by 301(b)(1) A and B are not stringent enough to protect any water quality standards applicable to such waters.
- The Clean Water Act Section 305(b) - Each state is required to submit a biennial report to the EPA describing the status of surface waters in that state.
- The Clean Water Act Section 319 - Each state is required to develop and implement a nonpoint source pollution management program.

- The Clean Water Act Section 402 - Establishes the National Pollutant Discharge Elimination System (NPDES) permitting program. Allows for delegation of permitting authority to qualifying states (which Indiana has received).

- The Clean Water Act Section 404/401 - Section 404 regulates the discharge of dredge and fill materials into navigable waters and adjoining wetlands. Section 401 requires the U.S. Army Corps of Engineers to receive a state Water Quality Certification prior to issuance a 404 permit.

State Authorities for Indiana's Water Quality Program

IC 13-13-5 Designation of Department for Purposes of Federal Law: Designates the Indiana Department of Environmental Management as the water pollution agency for Indiana for all purposes of the Federal Water Pollution Control Act (33 U.S.C. 1251 et seq.) effective January 1, 1988, and the federal Safe Drinking Water Act (42 U.S.C. 300f through 300j) effective January 1, 1988.

5.1.2 Indiana's Point Source Control Program

The State of Indiana's efforts to control the direct discharge of pollutants to waters of the State were inaugurated by the passage of the Stream Pollution Control Law of 1943. The vehicle currently used to control direct discharges to waters of the State is the NPDES (National Pollutant Discharge Elimination System) permit program. This was made possible by the passage of the Federal Water Pollution Control Act Amendments of 1972 (also referred to as the Clean Water Act). These permits place limits on the amount of pollutants that may be discharged to waters of the State by each discharger. These limits are set at levels protective of both the aquatic life in the waters which receive the discharge and human health.

The State of Indiana was granted primacy from U.S. EPA to issue NPDES permits on January 1, 1975 through a Memorandum of Agreement.

U.S. EPA, Region V, has oversight authority for the NPDES permits program. Under terms of the Memorandum of Agreement, Region V has the right to comment on all draft Major discharger permits. In addition to NPDES, the Office of Water Quality Permits Section has a pretreatment group which regulates municipalities in their development of municipal pretreatment programs and indirect discharges, or those discharges of process wastewater to municipal sewage treatment plants through Industrial Waste Pretreatment permits and regulation of Stormwater, CSO's, and variance requests through a special projects group currently known as the Urban Wet Weather Group. Land Application of waste treatment plant sludge is no longer a part of the Office of Water Quality but is now a part of the Office of Land Quality (formerly, Office of Solid and Hazardous Waste).

The purpose of the NPDES permit is to control the point source discharge of pollutants into the waters of the State such that the quality of the water of the State is maintained in accordance with the standards contained in 327 IAC 2. The NPDES permit requirements must ensure that the minimum amount of control is imposed upon any new or existing point source through the application of technology-based treatment requirement contained in 327 IAC 5-5-2. According to 327 IAC 5-2-2, "Any discharge of pollutants into waters of the State as a point source discharge, except for exclusions made in 327 IAC 5-2-4 is prohibited unless in conformity with a valid NPDES permit obtained prior to discharge." This is the most basic principal of the NPDES permit program.

The majority of NPDES permits have existed since 1974. This means that most of the permit writing is for permit renewals. Approximately 10 percent of each year's workload is attributed to new permits, modifications and requests for estimated limits. NPDES permits are designed to be re-issued every five years but are administratively extended in full force and effect indefinitely if the permittee applied for a renewal before the current permit expires.

There are several different types of permits that are issued in the NPDES permitting program. Table 5-1 lists and describes the various permits.

TABLE 5-1
TYPES OF PERMITS ISSUED UNDER THE NPDES PROGRAM

Type of Permit	Subtype	Comment
Municipal, Semi-Public or State (sanitary discharger)	Major	A facility owned by a municipality with a design flow Municipal of 1 MGD or greater (Cities, Towns, Regional Sewer Districts)
	Minor	Any municipally owned facility with a design flow of less than 1 MGD (Cities, Towns, Regional Sewer Districts)
	Semipublic	Any facility not municipally, State or Federally owned (i.e.- mobile home parks, schools, restaurants, etc.)
	State Owned	A facility owned or managed by a State agency (State parks, prisons, etc.)
	Federally Owned	A facility owned by a federal agency (military Owned installation, national park, federal penitentiary, etc.)
Industrial (Wastewater generated in the process of producing a product)	Major	Any point source discharger designated annually by agreement between the commissioner and EPA. Classification of discharger as a major involves consideration of factors relating to significance of impact on the environment, such as: Nature and quantity of pollutants discharged; Character and assimilative capacity of receiving waters; Presence of toxic pollutants in discharge; Compliance history of discharger.
	Minor	All dischargers which are not designated as major dischargers.
	General	General permit rule provides streamlined NPDES permitting process for certain categories of industrial point source discharges under requirements of the applicable general permit rule, rather than requirements of an individual permit specific to a single discharge. General permit rules: 327 IAC 15-7 Coal mining, coal processing, and reclamation activities; 327 IAC 15-8 Non-contact cooling water; 327 IAC 15-9 Petroleum product terminals; 327 IAC 15-10 Groundwater petroleum remediation systems; 327 IAC 15-11 Hydrostatic testing of commercial pipelines; 327 IAC 15-12 Sand, gravel, dimension stone or crushed stone operations.
	Cooling Water	Water which is used to remove heat from a product or process; the water may or may not come in contact with the product.
	Public Water Supply	Wastewater generated from the process of removing pollutants from ground or surface water for the purpose of producing drinking water.
Pretreatment Urban Wet Weather Group (Associated with NPDES but do not fall under same rule.)	Stormwater-related	Wastewater resulting from precipitation coming in contact with a substance which is dissolved or suspended in the water.
	Industrial Wastewater Pre-treatment	Processed wastewater generated by Industries that contribute to the overall wastewater received by the wastewater treatment plant.
	Combined Sewer Overflow (CSO)	Wastewater discharged from combined storm and sanitary sewers due to precipitation events. Municipal and Industrial Urban Wet Weather Programs

5.1.3 Nonpoint Source Control Programs

Nonpoint source (NPS) pollution is so named because the pollutants do not originate at single point sources, such as industrial and municipal waste discharge pipes. Instead, NPS pollutants are carried over fields, lawns, and streets by rainwater, wind, or snowmelt. This runoff may carry with it such things as fertilizer, road salt, sediment, motor oil, or pesticides. These pollutants either enter lakes and streams or seep into groundwater. While some NPS pollution is naturally occurring, most of it is a result of human activities.

Reducing NPS pollution requires careful attention to land use management and local geographic and economic conditions. The NPS Program was established to fully integrate methods for coping with the state's varied NPS water pollution problems. While a number of agencies and organizations currently have their own programs for addressing specific NPS issues, overall NPS coordination is being aided through the consolidated NPS Management Plan that was developed in the early stages of the Program's formation. Approximately, over 180 NPS-related projects have been funded and managed by the NPS Program since 1990. The NPS Management Plan was prepared in 1989, partially based on findings from the NPS Assessment Report, which was also completed that year. The NPS Management Plan was updated and received EPA approval in 1999. Some of the objectives of the Management Plan included the education of land users, the reduction and remediation of NPS pollution caused by erosion and sedimentation of forested and agricultural lands, and urban runoff. Other objectives addressed pesticide and fertilizer use, land application of sludge, animal waste practices, past and present mining practices, on-site sewage disposal, and atmospheric deposition.

The state's NPS Program, administered by the IDEM Office of Water Quality's Watershed Management Section, focuses on the assessment and prevention of NPS water pollution. The program also provides for the exchange of education and information in order to improve the way land is managed. Through the use of federal funding for the installation of best management practices (BMPs), the NPS Program effectively reaches out to citizens and assists in the development of BMPs to manage land in such a way that less pollution is generated. The NPS program promotes a non-regulatory, voluntary approach to solving water quality problems.

The many nonpoint source projects funded through the Office of Water Quality are a combination of local, regional, and statewide efforts sponsored by various public and not-for-profit organizations. The emphasis of these projects has been on the local, voluntary implementation of NPS water pollution controls. Since the inception of the program in the late 1980s, it has utilized over $12 million of federal funds for the development of over 180 projects.

The federal Clean Water Act contains nonpoint source provisions in several sections of the Act including the Section 319 Nonpoint Source Program, the Section 314 Clean Lakes Program (no longer funded), the Section 104(b)(3) Watershed Management Program, and the Section 205(j) Water Quality Planning Program. The Section 319 program provides for various voluntary projects throughout the state to prevent water pollution and also provides for assessment and management plans related to water bodies in Indiana impacted by NPS pollution. Section 314 has assessment provisions that assist in determining the nonpoint and point source water quality impacts on lakes and provides recommendations for improvements, but no longer receives funding. Section 104(b)(3) provides assistance in the development of watershed management planning efforts and education/information and implementation projects. Section 604(b) provides for planning activities relating to the improvement of water quality from nonpoint and point sources. The Watershed Management Section within the Planning Branch of the Office of Water Quality provides for the administration of the Section 319 funding source for the NPS-related projects. The Financial Management Services Branch of the Office of Water Quality administers the Section 104(b)(3) and Section 604(b) grants.

Clean Water Act Section 319(h) grant monies are made available to the states on an annual basis by EPA. Agencies and organizations in the state that deal with NPS problems submit proposals to the Office of Water Quality each year for use of these funds in various projects.

One of the most important aspects of all NPS pollution prevention programs is the emphasis on the watershed approach to these programs. This calls for users in the watershed to become involved in the planning and implementation of practices, which are designed to prevent pollution. By looking at the watershed as a whole, all situations causing the degradation of water quality will be addressed, not just a few. Appendix C lists the conservation partners and local stakeholders located in the Lower White River watershed.

5.1.4 Integrating Point and Nonpoint Source Pollution Control Strategies

Integrating point and nonpoint source pollution controls and determining the amount and location of the remaining assimilative capacity in a watershed are key long-term objectives of watershed management. The information is used for a number of purposes including: determining if and where new or expanded municipal or industrial wastewater treatment facilities can be allowed; setting the recommended treatment level at these facilities; and identifying where point and nonpoint source pollution controls must be implemented to restore capacity and maintain water quality standards.

<u>Total Maximum Daily Loads</u>

The Clean Water Act mandates an integrated point and nonpoint source pollution control approach. This approach, called a total maximum daily load (TMDL), uses the concept of determining the total pollutant loading from point and nonpoint sources that a waterbody can assimilate while still maintaining its designated use (maintaining water quality standards). EPA is responsible for ensuring that TMDLs are completed by States and for approving the completed TMDLs.

Under the TMDL approach, waterbodies that do not meet water quality standards are identified. States establish priorities for action, and then determine reductions in pollutant loads or other actions needed to meet water quality goals. The approach is flexible and promotes a watershed approach driven by local needs and directed by the State’s list of priority waterbodies. The overall goal in establishing the TMDL is to establish the management actions on point and nonpoint sources of pollution necessary for a waterbody to meet water quality standards.

The Office of Water Quality at IDEM is in the process of reorganizing its work activities around a five year rotating basin schedule. The waters of the state have been grouped geographically into major river basins, and water quality data and other information will be collected and analyzed from each basin, or group of basins, once every five years. The schedule for implementing the TMDL Strategy is proposed to follow this rotating basin plan to the extent possible. The TMDL Strategy discusses activities to be accomplished in three phases. Phase One involves planning, sampling and data collection and would take place the first year. Phase Two involves TMDL development and would occur in the second year, and Phase Three is the TMDL implementation and would occur the third year. It is expected that some phases, especially implementation of TMDLs (Phase Three) in the basin(s), may take more than one year to fully accomplish.

Initially, as part of the TMDL Strategy in a watershed, the IDEM TMDL Program Manager, in coordination with the IDEM Basin Coordinator of the target basin, will develop an activity reference guide for each TMDL. This activity reference guide will provide: (1) a list of the necessary activities and tasks, (2) a schedule for completing activities and tasks associated with an individual TMDL, and (3) a roster that indicates which Section, staff, and /or contractor are responsible for completion of each activity/task.

In Phase Three, the TMDL scenario chosen in conjunction with watershed stakeholders during Phase Two will be used to develop a plan to implement the TMDL. During this process, stakeholder participation will be essential. The Basin Coordinator, in conjunction with the stakeholder groups, will develop a plan to implement the TMDL. Once the draft plan has been finalized through comments from stakeholder groups and IDEM, the plan becomes 'draft-final' and open public review. Public meetings will be held in areas affected to solicit comments.

5.1.5 Potential Sources of Funding for Water Quality Projects

There are numerous sources of funding for all types of water quality projects. The sources of funding include federal and state agencies, nonprofits, and private funding. Funds may be loans, cost-share projects, or grants. Section 319(h) grants and other funding sources are discussed below.

If a local government, environmental group, university researcher, or other individual or agency wants to find funding to address a local water quality problem, it is well worth the time to prepare a thorough but concise proposal and submit it to applicable funding agencies. Even if a project is not funded, follow-up should be done to determine what changes may be needed in order to make the application more competitive.

<u>Section 319(h) Grants</u>

EPA offers to the state Clean Water Act Section 319(h) grant moneys on an annual basis. These grants must be used to fund projects that address nonpoint source pollution issues. Some projects which the Office of Water Quality has funded with this money in the past include best management practice (BMP) demonstrations, watershed water quality improvements, data management, educational programs, modeling, stream restoration, and riparian buffer establishment. Units of government, nonprofit groups, and universities in the state that have expertise in nonpoint source pollution problems are invited to submit Section 319(h) proposals to the Office of Water Quality.

Office of Water Quality staff review proposals for minimum 319 eligibility criteria such as:

- Does it support the state NPS Management Program milestones?
- Does the project address targeted, high priority watersheds?
- Is there sufficient non-federal cost-share match available (25% of project costs)?
- Are measurable outputs identified?
- Is monitoring required? Is there a Quality Assurance/Quality Control plan for monitoring?
- If a Geographical Information System is used, is it compatible with that of the state?
- Is there a commitment for educational activities and a final report?

- Are upstream sources of NPS pollution addressed?
- Are stakeholders involved in the project?

Office of Water Quality staff separately review and rank each proposal which meets the minimum 319 eligibility criteria. In their review, members consider such factors as: technical soundness; likelihood of achieving water quality results; degree of balance lent to the statewide NPS Program in terms of project type; and competence/reliability of contracting agency. They then convene to discuss individual project merits, to pool all rankings and to arrive at final rankings for the projects. Comments are also sought from outside experts in other governmental agencies, nonprofit groups, and universities. The Office of Water Quality seeks a balance between geographic regions of the state and types of projects. All proposals that rank above the funding target are included in the annual grant application to EPA, with EPA reserving the right to make final changes to the list. Actual funding depends on approval from EPA and yearly congressional appropriations.

To obtain more information about applying for a Section 319(h) grant, contact:

Susan McLoud, Watershed Management Section Chief
IDEM Office of Water Quality
100 N. Senate Avenue
P.O. Box 6015
Indianapolis, IN 46206-6015
(317) 232-0019

Other Sources of Funding

Besides Section 319(h) funding, there are numerous sources of funding for all types of water quality projects. The sources of funding include federal and state agencies, nonprofit, and private funding. Funds may be loans, cost-shares, or grants. Appendix D provides a summary list of agencies and funding opportunities.

5.2 Indiana Department of Natural Resources Water Programs

5.2.1 Division of Soil Conservation

The Division of Soil Conservation's mission is to ensure the protection, wise use, and enhancement of Indiana's soil and water resources. The Division's employees are part of Indiana's Conservation Partnership, which includes the 92 soil and water conservation districts (SWCDs), the USDA Natural Resources Conservation Service, and the Purdue University Cooperative Extension Service. Working together, the partnership provides technical, educational, and financial assistance to citizens to solve erosion and sediment-related problems occurring on the land or impacting public waters.

The Division administers the Clean Water Indiana soil conservation and water quality program under guidelines established by the State Soil Conservation Board, primarily through the SWCDs in direct service to landusers. The Division staff includes field-based resource specialists who work closely with landusers, assisting in the selection, design, and installation of practices to reduce soil erosion on their land. Regional Urban Conservation Specialists work primarily with developers, contractors, and others to address erosion and sediment concerns in urban settings, developments under construction, and in landfills. The Lake and River Enhancement staff (LARE) oversee all administrative, operational, and technical aspects of the LARE program, which provides financial assistance to local entities concerned with improving and maintaining water quality in public-access lakes, rivers, and streams.

5.2.2 Division of Water

The IDNR, Division of Water (DOW) is charged by the State of Indiana to maintain, regulate, collect data, and evaluate Indiana's surface and ground water resources.

The Engineering Branch of the DOW includes Dam and Levee Safety, Project Development, Surveying, Drafting, and Computer Services. The Dam and Levee Safety Section performs geotechnical and hydraulic evaluation on existing and proposed dams and levees throughout the State. The Project Development Section provides technical support to locally funded water resource projects along with engineering leadership and construction management to State funded water resource projects. The remaining sections provide support services to all Sections within the DOW such as reservoir depth mapping, topographic mapping, highwater marks, design of publications and brochures, and computer procurement and maintenance.

The Planning Branch of the DOW consists of Basin Studies, Coastal Coordination, Floodplain Management, Ground Water, Hydrology and Hydraulics, and Water Rights. Basin Studies are comprehensive reports on surface-and ground-water availability and use. Coastal Coordination is a communication vehicle to address Lake Michigan's diverse shoreline issues. Floodplain Management involves various floodplain management aspects including coordination with the National Flood Insurance Program and with State and Federal Emergency Management agencies during major flooding events. The Ground Water Section maintains the water-well record computer database and publishes reports and maps on the ground-water resource for the State. Hydrology and Hydraulics Section develops and reviews floodplain mapping and performs hydrologic studies and modeling. The Water Rights Section investigates and mediates groundwater/surface water rights issues, licenses water-well drillers, and develops well construction and abandonment procedures.

The Regulations Branch of DOW is made up of Stream Permits, Lake Permits, Permit Administration, Public Assistance, and Legal Counsel. The Stream Permits Section is responsible for reviewing permit applications for construction activity in the 100-year regulatory floodway along Indiana's waterways. The Lake Permits Section reviews construction projects at or below the legal lake level for all of Indiana's public freshwater lakes. Permit Administration Section provides administrative support to Branch staff, maintains the application database, and coordinates the application review process with other Divisions. The Public Assistance Section provides technical assistance on possible permit applications on proposed construction projects, investigates and mediates unpermitted construction activities and in some cases with the support of Legal Counsel pursues legal action for violation of State laws.

5.3 USDA/Natural Resources Conservation Service Water Quality Programs

While there are a variety of USDA programs available to assist people with their conservation needs. The following assistance programs are the principal programs available.

Conservation Technical Assistance (CTA)

The purpose of the program is to assist landusers, communities, units of state and local government, and other Federal agencies in planning and implementing conservation systems. The purpose of the conservation systems are to reduce erosion, improve soil and water quality, improve and conserve wetlands, enhance fish and wildlife habitat, improve air quality, improve pasture and range condition, reduce upstream flooding, and improve woodlands.

The objective of the program is to: Assist individual landusers, communities, conservation districts, and other units of State and local government and Federal agencies to meet their goals for resource stewardship and assist individuals to comply with State and local requirements. NRCS assistance to individuals is provided through conservation districts in accordance with the Memorandum of Understanding signed by the Secretary of Agriculture, the Governor of the State, and the conservation district. Assistance is provided to landusers voluntarily applying conservation and to those who must comply with local or State laws and regulations. Assistance is also provided to agricultural producers to comply with the highly erodible land (HEL) and wetland (Swampbuster) provisions of the 1985 Food Security Act as amended by the Food, Agriculture, Conservation and Trade Act of 1990 (16 U.S.C. 3801 et. seq.); the Federal Agriculture Improvement and Reform Act of 1996, and wetlands requirements of Section 404 of the Clean Water Act. NRCS makes HEL and wetland determinations and helps land users develop and implement conservation plans to comply with the law. They also provide technical assistance to participants in USDA cost-share and conservation incentive programs. NRCS collects, analyzes, interprets, displays, and disseminates information about the condition and trends of the Nation's soil and other natural resources so that people can make good decisions about resource use and about public policies for resource conservation. They also develop effective science-based technologies for natural resource assessment, management, and conservation.

Conservation of Private Grazing Land Initiative (CPGL)

The Conservation of Private Grazing Land initiative will ensure that technical, educational, and related assistance is provided to those who own private grazing lands. It is not a cost-share program. This technical assistance will offer opportunities for: better grazing land management; protecting soil from erosive wind and water; using more energy-efficient ways to produce food and fiber; conserving water; providing habitat for wildlife; sustaining forage and grazing plants; using plants to sequester greenhouse gases and increase soil organic matter; and using grazing lands as a source of biomass energy and raw materials for industrial products.

Conservation Reserve Program (CRP)

NRCS provides technical assistance to landowners interested in participating in the Conservation Reserve Program administered by the USDA Farm Service Agency. The Conservation Reserve Program reduces soil erosion, protects the Nation's ability to produce food and fiber, reduces sedimentation in streams and lakes, improves water quality, establishes wildlife habitat, and enhances forest and wetland resources. It encourages farmers to convert highly erodible cropland or other environmentally sensitive acreage to vegetative cover, such as tame or native grasses, wildlife plantings, trees, filterstrips, or riparian buffers. Farmers receive an annual rental payment for the term of the multi-year contract. Cost-share funding is provided to establish the vegetative cover practices.

Environmental Quality Incentives Program (EQIP)

The Environmental Quality Incentives Program provides technical, educational, and financial assistance to eligible farmers and ranchers to address soil, water, and related natural resource concerns on their lands in an environmentally beneficial and cost effective manner. The program provides assistance to farmers and ranchers in complying with Federal, State, and tribal environmental laws, and encourages environmental enhancement. The program is funded through the Commodity Credit Corporation. The purposes of the program are achieved through the implementation of a conservation plan, which includes structural, vegetative, and land management practices on eligible land. Five to ten year contracts are made with eligible producers. Cost-share payments may be made to implement one or more eligible structural or vegetative practices, such as animal waste management facilities, terraces, filter strips, tree planting, and permanent wildlife habitat. Incentive payments can be made to implement one or more land management practices, such as nutrient management, pest management, and grazing land management.

Fifty percent of the funding available for the program is targeted at natural resource concerns relating to livestock production. The program is carried out primarily in priority areas that may be watersheds, regions, or multi-state areas, and for significant statewide natural resource concerns that are outside of geographic priority areas.

Watershed Surveys and Planning

The Watershed and Flood Prevention Act, P.L. 83-566, August 4, 1954, (16 U.S.C. 1001-1008) authorized this program. Prior to fiscal year 1996, small watershed planning activities and the cooperative river basin surveys and investigations authorized by Section 6 of the Act were operated as separate programs. The 1996 appropriations act combined the activities into a single program entitled the Watershed Surveys and Planning program. Activities under both programs are continuing under this authority.

The purpose of the program is to assist Federal, State, and local agencies and tribal governments to protect watersheds from damage caused by erosion, floodwater, and sediment and to conserve and develop water and land resources. Resource concerns addressed by the program include water quality, opportunities for water conservation, wetland and water storage capacity, agricultural drought problems, rural development, municipal and industrial water needs, upstream flood damages, and water needs for fish, wildlife, and forest-based industries.

Types of surveys and plans include watershed plans, river basin surveys and studies, flood hazard analyses, and flood plain management assistance. The focus of these plans is to identify solutions that use land treatment and non-structural measures to solve resource problems.

Watershed Program and Flood Prevention Program (WF 08 or FP 03)

The Small Watershed Program works through local government sponsors and helps participants solve natural resource and related economic problems on a watershed basis. Projects include watershed protection, flood prevention, erosion and sediment control, water supply, water quality, fish and wildlife habitat enhancement, wetlands creation and restoration, and public recreation in watersheds of 250,000 or fewer acres. Both technical and financial assistance are available.

Wetlands Reserve Program (WRP)

The Wetlands Reserve Program is a voluntary program to restore wetlands. Participating landowners can establish conservation easements of either permanent or 30 year duration, or can enter into restoration cost-share agreements where no easement is involved. In exchange for establishing a permanent easement, the landowner receives payment up to the agricultural value of the land and 100 percent of the restoration costs for restoring the wetlands. The 30 year easement payment is 75 percent of what would be provided for a permanent easement on the same site and 75 percent of the restoration cost. The voluntary agreements are for a minimum 10 year duration and provide for 75 percent of the cost of restoring the involved wetlands. Easements and restoration cost-share agreements establish wetland protection and restoration as the primary land use for the duration of the easement or agreement. In all instances, landowners continue to control access to their land.

Wildlife Habitat Incentives Program (WHIP)

The Wildlife Habitat Incentives Program provides financial incentives to develop habitat for fish and wildlife on private lands. Participants agree to implement a wildlife habitat development plan and USDA agrees to provide cost-share assistance for the initial implementation of wildlife habitat development practices. USDA and program participants enter into a cost-share agreement for wildlife habitat development. This agreement generally lasts a minimum of 10 years from the date that the contract is signed.

REFERENCES

Birkhimer, James. 2000. Personal communication between James Birkhimer, Natural Resources Conservation Service and James Dunaway, NRCS/IDEM Liaison, about local septic issues.

Bunce, Nigel J. 1994. *Environmental Chemistry*. Second Edition. Wuerz Publishing Ltd., Winnipeg, Canada.

Cale. 2000. Personal communication between Cale, Brown County Health Department and Andy Ertel, NRCS/IDEM Watershed Conservationist, about local septic issues.

Indiana Business Research Center (IBRC). 1993. Indiana County Population Projections 1990-2030. http://www.statelib.lib.in.us/www/rl/projections.html

IBRC. 1997. Indiana Cities and Towns Population. http://www.iupui.edu/it/ibrc/Population/CITYEST/allcities.html Last Updated: November

Indiana Department of Environmental Management (IDEM). 1998. Indiana 305(b) Report *Indiana Water Quality Report 1998*. Office of Water Quality

IDEM. 1999. Confined Feeding Operations. As presented on http://www.state.in.us/idem/oshwm/confined.html

Indiana Department of Natural Resources (IDNR). 1980. *The Indiana Water Resource*. Indiana Department of Natural Resources, Indianapolis, IN.

IDNR, Division of Forestry, 2000. As presented on http://www.state.in.us/dnr/forestry/htmldocs/property.htm Last accessed: February 7, 2000

IDNR, Division of State parks and Reservoirs, 2000. As presented on http://www.state.in.us/dnr/ Last accessed: February 7, 2000

IDNR, Division of Reclamation, 2000. As presented on http://www.state.in.us/dnr/reclamation/education.html Last accessed: February

Indiana State University (ISU),1999. Indiana GAP Analysis Home Page. http://139.102.7.220/h1/bertha/gap/ Last accessed: June

Luczynski, Dan. 2000. Personal communication between Dan Luczynski, Natural Resources Conservation Service and James Dunaway, NRCS/IDEM Liaison, about local septic issues.

Natural Resources Commission(NRC),1997. Outstanding Rivers List for Indiana. As presented on http://www.ai.org/nrc/outstand.htm Last update: October.

NRC. Undated. Conservancy Districts, Procedure. As presented on http://www.ai.org/nrc/procedur.htm Last Accessed: October

Nature Conservancy, The, 2000. As presented on http://www.tnc.org/frames/index.html?/progress/index.html Last accessed: February

Naval Surface Warfare Center, Crane Division, 2000. As presented on http://www.crane.navy.mil/nat_res/index.htm Last accessed: February

U.S. Department of Agriculture (USDA). 1997. 1997 Census of Agriculture Profiles: Indiana State and County Profiles Ranked Items and Other County Summary Data. http://www.nass.usda.gov/census/census97/profiles/in/inb.htm

U.S. Department of Agriculture -Natural Resources Conservation Service (NRCS)- formerly the Soil Conservation Service. 1988. As reported in the *Soil Survey of Greene County, Indiana.*

U.S. Department of Agriculture -Natural Resources Conservation Service (NRCS)- formerly the Soil Conservation Service. 1981. As reported in the *Soil Survey of Knox County, Indiana.*

U.S. Environmental Protection Agency (EPA). 1997. Guidelines for Preparation of the State Water Quality Assessments (305[b] Reports) and Electronic Updates: Report Contents. Washington, DC: U. S. Environmental Protection Agency. *EPA-841-B-97-002A*.

U.S. Fish and Wildlife Service (US F&WS), County List of Federal Threatened, Endangered, and Proposed Species (February 1998), http://www.fws.gov/r3pao/eco_serv/endangrd/lists/indiana.html

U.S. Geological Survey (USGS), and EPA. Undated. Ecoregions Map of Indiana and Ohio. USGS, P.O. Box 25286, Denver, Colorado 80225. ISBN 0-607-90528-x.